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VOL. 103 *Friday, February 1, 1946* NO. 2666

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George R. Harrison

The Science Section of Biarritz American University

Stanley A. Cain

Domestic Control of Atomic Energy

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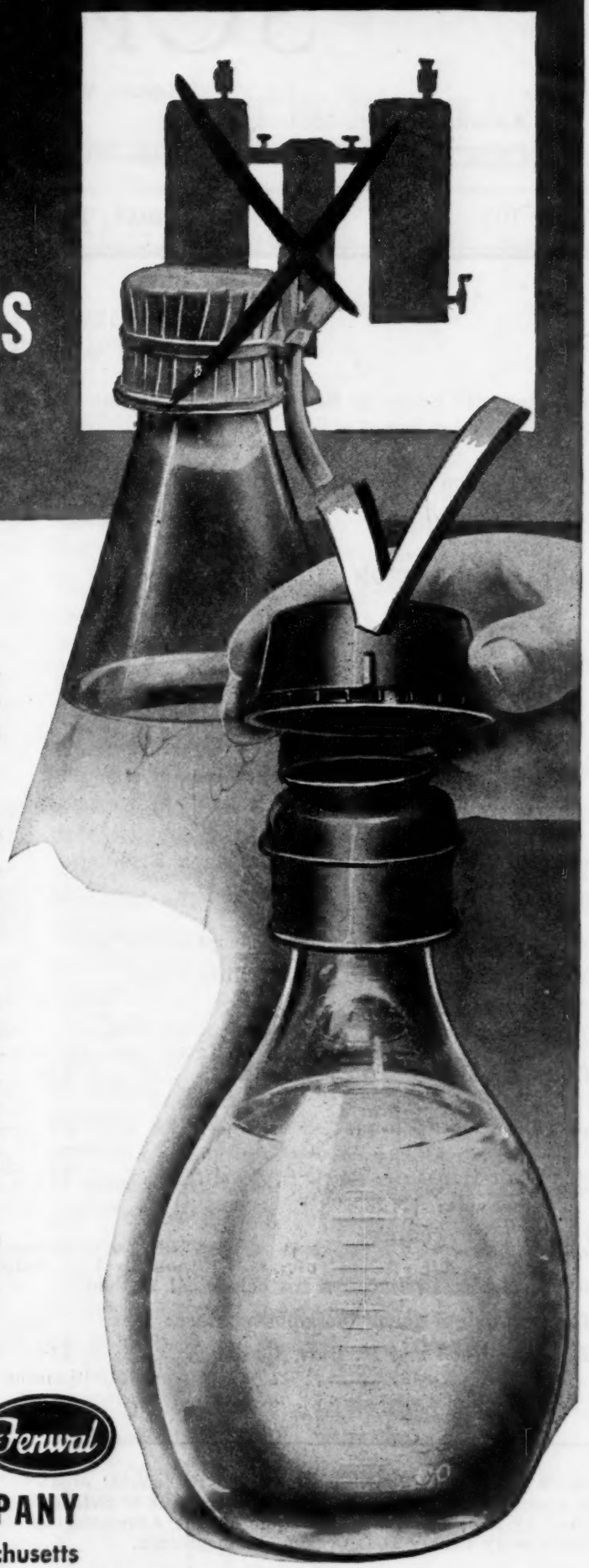

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SCIENCE: A Weekly Journal, since 1900 the official organ of the American Association for the Advancement of Science. Published by the American Association for the Advancement of Science every Friday at Lancaster, Pennsylvania.

Communications relative to articles offered for publication should be addressed to Editor, Massachusetts and Nebraska Avenues, Washington 16, D. C.

Communications relative to advertising should be addressed to THEO. J. CHRISTENSEN, Massachusetts and Nebraska Avenues, Washington 16, D. C.

Communications relative to membership in the Association and to all matters of business of the Association should be addressed to the Permanent Secretary, A.A.A.S., Smithsonian Institution Building, Washington 25, D. C.

Annual subscription, $6.00 Single copies, 15 cents

Entered as second-class matter July 18, 1923 at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

SCIENCE

Vol. 103, No. 2666 Friday, February 1, 1946

The Importance of Scientific Research in the Postwar Era[1]

George R. Harrison
Massachusetts Institute of Technology

THIS IS AN ESPECIALLY GOOD TIME to discuss the relation of research to postwar industry and agriculture, for not only has the postwar era arrived with a bang, but there has been a major change in the whole relation of science to the social structure within the past eighty days. I am therefore especially pleased to come at this time to Birmingham, where so promising a start has been made by the Southern Research Institute.

I need not tell this audience that the prosperity of the South depends on expansion of southern industry. Everyone present is aware that scientific research furnishes one of the most effective ways of promoting agriculture and industry. It is easy to quote exact figures in almost any industry one may choose to show how research has made possible a better product at a cheaper price, thus increasing sales and boosting both profit and wages. Department of Commerce figures show that, in 1926, two hundred thousand mechanical refrigerators were sold at $400 apiece. As a result of research and the increased know-how which resulted, a much better refrigerator could be sold ten years later for $160, or less than half as much, so two million, or ten times as many, were sold. In the radio field similar figures can be quoted. In 1926 one and three-quarters million radio sets were sold at an average price of $114. Ten years later, sets which were far better cost an average of $54.50, or less than half as much, and eight and a half million, or nearly five times as many, were sold. You may say that much of this improvement can be credited to the development of improved methods of production, but no one will deny that the most direct way to develop such improved methods is to study them systematically—in other words, carry on research.

In citing specific examples of effects of research on industry, I shall steer clear of selecting those dealing with our own Southland, regarding which you are so much better informed than I. Instead, for cotton I shall substitute wool and refer to a land much farther South and about 180° West. If you think your area needs industrial expansion, take a trip to the Antipodes, where nearly half the people in a continent larger than the United States live in three great cities hundreds of miles apart. The transportation system connecting Brisbane, Sydney, and Melbourne in Australia until recently consisted of slow-moving vessels plus a series of railways, much of whose rolling stock was discarded by the Long Island Railroad in 1905. I use Australia as an example, because its needs for research are similar to, but even more extreme than, those of the southeastern United States, and because the Australians have in recent years shown the same progressive spirit as yourselves and the same realization that scientific and technological research is the only answer to their most pressing problems. They are following this approach with the same vigor and success which mark your own efforts.

A year ago I spent several months in Australia. Like that of the South, her economy has been built up largely on primary rather than on secondary industries, and thus chiefly on wool, wheat, beef, and mutton. This is all very well in normal times, when an empire will take your wool, scour and weave it, and give back manufactured products in exchange. Most of the profits remain in the empire, however, and in an emergency weaknesses begin to show up. During the war there was a great shortage of lanolin for greasing rifles in Australia, although most of the world's lanolin originates there. In normal times wool was shipped from Australia to France, where the lanolin was removed and purified; then the wool went on to England for further processing, and some of the lanolin went back to Australia. When France fell, the lanolin industry disappeared, and Australians did not even know how to get lanolin out of their own wool.

Recent years brought a still worse bugaboo to terrify the wool grower (for "wool" read "cotton"). New textile materials were appearing from research labora-

[1] Address delivered before the Advisory Council, Southern Research Institute, Birmingham, Alabama, 25 October 1945.

tories in other countries. Rayons and nylons entered the market, and rumors were heard of even more dangerous competitors of wool. The Australians did not take this sitting down. Their very effective Council for Scientific and Industrial Research put to work research scientists who soon discovered a new way of greatly reducing the shrinkage of wool by treating the fibers before the spinning process. They also set to work on the problem of making woolen strands distasteful to moth larvae and were having a fair degree of success at the time of my visit.

The Council for Scientific and Industrial Research has under its direction ten active research laboratories to serve seven million people. How many people are there in the southeastern United States?

I saw another example of Australian vigor in research in the optical industry. When the Japanese were coming over the Kokoda Trail in New Guinea and the people of Queensland had their automobiles loaded to move their families south at a moment's notice, the Australian optical industry consisted of a fine collection of sand banks. The Armed Forces needed optical instruments of the highest quality—roof prisms for range finders, for example, which had to be accurate in angle to within two seconds so that rays of light reflected by them would not deviate from their correct path by more than one foot in twenty miles. Ordinarily, these could be made satisfactorily only by the most skilled optical workers having years of experience. The Australians converted three academic laboratories into optical plants, made their own optical glass from local materials, and soon developed the needed skills for fashioning the most delicate optical parts. Two university physics departments had optical shops in quantity production when I was there, and astronomers in the Commonwealth Observatory, high up on Mount Stromlo, had taken their gaze from the stars and were working on tank telescopes. So successful were their efforts that they were shipping large quantities of roof prisms to the Frankford Arsenal in Pennsylvania. Now Australia has an optical industry.

Though there are said to be at least 2,264 industrial research laboratories in this country, too many corporations have set up what they call research laboratories, which are merely developmental and trouble-shooting laboratories. It is not easy for a board of directors to decide to invest funds, labor, and equipment when some direct, immediate return cannot be seen; yet that type of faith and imagination is what is required if the greatest financial return is to be realized. The greatest practical returns from research come when one is willing to cast his bread upon the waters and relax, as far as that particular bread is concerned, secure in the knowledge that eventually it will return manyfold.

The small industrial corporation cannot support a research laboratory of its own, yet it cannot afford to get along without research for improving its product and developing new products. It is to supply the need of such firms that such laboratories exist as those of the Southern Research Institute, the Mellon Institute, and the various university foundations, of which the Division of Industrial Cooperation, Massachusetts Institute of Technology, is typical. This is the first stage.

As a firm builds up its organization it ultimately reaches a point where it can support a research laboratory of its own. This is the second stage. But if any industry is satisfied to stop with even the second stage, its profits will remain at a level far below that which proper acumen makes possible. The needed third stage is that which may be called directed basic research, a typical example of which is given by the sugar industry. A large number of manufacturers of cane and beet sugar have banded together in the Sugar Foundation, which supports research on the chemistry of sugar in a large number of university laboratories. What is wanted is more information about sugar and what it is good for. When this information is obtained, the public will benefit in obvious ways, and the sugar industry will benefit from increased use of its product. Such broad-minded research is spreading as the benefits to those who support it become apparent and has already produced remarkable results in a large number of fields.

The fourth stage we may call "disinterested basic research." This is the most important of all, for without it the others soon lose sustenance. In years past it was difficult to convince a board of directors that they should make contributions which would enable a "dreamy" scientist to work in his laboratory on whatever he pleased. If they had not come to see that no apparently isolated fact is useless, and that the nonavailability of any particular bit of information may later make impossible the solution of a specific problem, American prosperity would be on a far lower level than it is.

Fundamental research usually could not in the past be undertaken with guaranteed immediate profit by any one company or even by one industry. It has to be supported by the whole economic community because it was of such broad scope. It was carried on chiefly in the research laboratories of universities and the great foundations. Thirty years might elapse between the discovery of the photoelectric effect, for example, and the development from it of an electric eye for television and talking motion pictures; or between the discovery of the electron and the development

an electron tube for radio, or radar, or telephony, or a dozen other new industries. Yet this period is being shortened rapidly, for the more we know, the more we are able to find out, and the greater the number of pieces which have been fitted into the jig-saw puzzle of nature, the easier it is to fit in the remaining pieces, even though the area of the picture grows larger all the time.

Fundamental research is now, however, becoming a profitable undertaking for some of the larger corporations. The director of the Research Laboratory of the General Electric Company some years ago told me that he and his predecessors spent much of their time trying to get their research personnel back into the fundamental research which they had started thirty years ago. The original idea of their laboratory was the disinterested study of nature, because its director, Dr. Whitney, had the imagination to see that this was what would pay most in the long run. Over and over again, researchers in such laboratories as those of the General Electric Company and the Bell Telephone Company have been set to work in some field of fundamental research only to have one after another profit-bringing result intrude itself upon their notice.

I suppose that the reason digging for truth is not only more interesting, but more profitable, than digging for gold is that if urged on by the love of digging, one digs more deeply than if searching for some particular nugget. Practicality is likely to be short-sighted and looks so hard for some single objective that it may miss much that nature presents to one who is purposely digging for whatever may turn up.

When someone succeeds in inventing a gun which will shoot a bullet around a corner, it may become reasonable to expect to predict the outcome of any individual piece of research—that is, of real research as distinct from mere development. Progress in science is almost always made around corners instead of in straight lines. Most great discoveries have been made out of the corner of someone's eye. The most successful research laboratories are those in which funds are allotted to support research activities, a crew is set to work, and then everyone stops worrying about whether any particular job is going to pay back its cost in one year or ever.

The director of one of our most progressive research laboratories once told me with great pride that he had guessed wrong on nine out of ten of the greatest developments that had come from his laboratory. He was proud, not of the incorrectness of his guesses but of the fact that he never let them stand in the way of progress. When one of his young men came to him with a bright idea, he usually spent half an hour shooting it full of holes. Then, as the young fellow turned away, disappointed, he would say, "Go ahead and try it anyway. Work on this a bit and maybe you can prove me wrong." The young man worked, and although his original idea may have turned sour, something usually came of his research which led eventually to a new product, as likely as not to be more important than the one originally contemplated. You mak ask, "What is the function of a research director who is wrong nine times out of ten?" My friend said that his function is to listen to a man whenever he has an idea, give him credit when his ideas work, and see that he is kept cheerful so that his ideas continue to flow. As a result of this far-sighted policy, this corporation has ridden out all the ups and downs of economic storm, is almost without competition in its field, has stocks which are always considered to be a gilt-edged investment, and makes most of its profits from products which were not even thought of fifteen years ago.

Several years ago, Dr. Karl Compton told the National Association of Manufacturers that 2 per cent of the gross income of any industry could be expended effectively on research. Since then, this advice has been amply borne out, and the world has been plunged into a war in which the value of research has been demonstrated for all to see, as the strength of nations has been primarily their scientific and industrial strength. Britain was saved by the Royal Air Force, but it was only by a Royal Air Force implemented by the Radar that their scientists furnished in the nick of time. Since then, the Office of Scientific Research and Development under Dr. Vannevar Bush, skimming the cream of American scientific effort, has successfully aided our Armed Forces with a constantly increasing flow of new weapons and devices, which, taken in conjunction with those developed by the Services themselves, kept us abreast, and often ahead, of similar German advances. Those who expect great peacetime technological advances as a result of this extra wartime effort will not be disappointed, but it is still too early to discuss many of these advances in any specific way. One can only point to those industries involving air transport, electronic devices, food technology, and medicine as obvious examples of fields in which great strides are being made.

I should like nothing more than to be able to give you a list of new products of the next decade in the way of foolproof family airplanes; cheaply operated deep-freeze refrigerators; new types of cookery involving infrared rays and high-frequency radio waves; new runless, snagless super nylon fabrics; new medicines rendering atabrine, penicillin, and the sulfa drugs obsolete; new insecticides like DDT but selective so that, though they deal death to a mosquito or a

fly, they furnish nourishing vitamins to a honeybee; fluorescent lamps that burn softer and brighter than our present lamps; plastics that can be molded with a putty knife, only to set into hardness that cannot be dented with an ax; metals lighter than aluminum yet as strong and cheap per unit volume as steel; synthetic rubbers of a dozen kinds, so that while one gives a tire that will roll a hundred thousand miles, another makes tougher and thinner raincoats which do not run, stick, or offend the nostrils. I could go on endlessly with such a list, but you have all heard the predictions. The limitation on such prophecies is that the items we can foresee are only the minor ones; the unwritten part of the list will expand into a thousand additional devices which have not yet been thought of, but which the next generation will consider essentials of living. So, if you ask for a list of the better things which Americans can expect someday to have available, I refer you to a list of what Americans want. So great is my faith in the ability of the chemist ultimately to put atoms together into any kind of molecule that may be needed to produce any desired drug, plastic, textile fiber, vitamin, or rainbow-colored dye, and of the physicist to discover new kinds of X-rays to see through steel, new Radar waves to see through clouds, to shell electrons out of atoms to operate the new radios, televisors, multichannel telephone sets, and sound recorders, that I set no limit on the ability of nature, fundamental and applied research, and American industry to furnish what is wanted.

So, let the American citizen, or the citizen of any nation, make out a list of the things he would like to own. Let him list a car for every member of the family and a radio in every car if his imagination will not provide him with anything better. Then someone will ask, "Who is going to pay for all this?" It is a good question, but it shows ignorance of the nature of wealth. Our national debt, now touching three hundred billion dollars, merely involves the redistribution of purchasing power. And while it entails problems of its own, we are discussing now the over-all wealth of the South, of the nation, and of the world. Purchasing power means ability to get all of these things, these better products we are talking about, and involves only two things—energy, and the knowledge of how to control it. When people want better food, clothing, shelter, health, transport, education, security, and relaxation, they are presenting problems involving improved control of energy. After all, the cave man had all the iron, copper, and other materials necessary to make himself a fine refrigerator; and every single iron atom used in building our normal four million cars per year was present on earth in Archimedes' day. Why is the purchasing power of the American citizen twenty times as great as that of a Chinese coolie? You know that it is because he can produce more than twenty times as much output. He knows how to direct and control industrial power by the flow of energy. Increase the amount of energy he can control, and you can afford to increase his wages and his purchasing power. Each day the average American citizen consumes energy which, if produced by the human arm as used in pumping water or sawing wood, would require three daily shifts of thirty men each; that is ninety men working eight hours a day. The American citizen can have this energy because it need not be produced by the human arm, but is furnished instead by Diesel, steam, and gasoline engines and by electric motors.

Can the purchasing power of the American workman be further increased? Of course it can. There is no Malthusian law which says that the wealth of the world is so much and this is not enough to support more than so many millions of people. What sets the limit to social wealth at any moment? It is the amount of energy the average workman is able to direct and control effectively. Double this, and you double the national wealth level, the profit level, the wage level, and the purchasing power of the individual.

What sets the limit to our ability to direct energy? First, it is having the energy to direct, and here we need have no worries. We have always had thousands of times as much energy available as we have been able to control. Let the oil pools be exhausted in ten or a hundred years; let the coal fields disappear in one century or ten; forget about the uranium ores and other sources of atomic energy—if you can. Every day the earth soaks up enough energy from the sun to run all the industries of the world at the present rate for two hundred thousand days to come. Some of this energy we now use in water power and in farming, and I know of no scientist who worries much about our ability ultimately to learn how to harness a larger fraction of the remainder. (The wealth level can be raised two thousand times over what it is at present and still leave a greater than one hundredfold factor of safety. Research will show how best to direct and control this energy, and only research can bring us this wealth.

In conclusion, I congratulate you of the Southern Research Institute on the splendid start you have made. I hope, however, you will not sit back and be satisfied. Build up your industrial research and research in your universities and colleges, for in the long run the whole thing depends on one product—men of imagination. I cannot believe that in the product the South is not equal to any place on earth.

The Science Section of Biarritz American University

Stanley A. Cain, *Chief*

BIARRITZ AMERICAN UNIVERSITY and its slightly older sister at Shrivenham, England, are experiments in education under Army auspices that deserve to be described for American educators.

Organization of the University

The organization of Biarritz American University is in many ways different from that of the usual university in the States. There are two reasons for the differences: Not only is this installation responsible for all housekeeping and service functions, as well as for the usual academic ones, but it also has the dual organization of the military and the civilian academic line-and-staff structures.

The Commandant, Brig. Gen. S. L. McCroskey, assisted by an executive, an assistant executive, an aide, and an office staff, has complete responsibility for BAU and, consequently, final authority. Attached to his office is a Visitors' Bureau. The chain of command separates from the Commandant to the directors of six divisions. Under the *Director of Administration* are the staffs and functions of Post Administration, Academic Administration, Finance, Military Personnel, and Civilian Personnel. Under the *Troop Commander and Headquarters Commandant* are numerous responsibilities and functions. The Headquarters Student Brigade has control of the five battalions into which the 4,000 students are organized. The Station Complement includes six companies which must supervise or carry out guard, labor, supply, utility, billeting, special service, military police, motor transportation, and other duties. Also under Headquarters are the Hospital, the Fire Marshal, and the Billeting and Mess Sections. The *Director of Supply* is in charge of the sections of Post Supply, Academic Supply, and Transportation Movements. The *Director of Special Services* has charge of Athletics, Recreations, Post Exchange, Special Supply, and Band sections. The *Special Staff* is not headed by a Director, each of its chief officers having direct access to the Commandant. The offices of the Special Staff are those of Public Relations, Surgeon, Chaplain, Staff Judge Advocate, French Liaison, Supervisor of Women, Historian, and the Academic Adviser. Under the *Director of Academics* are eight academic sections which correspond to colleges and the overall functions of Visual Aids, Library, Book Shop, and Counseling Section.

The task of fitting an installation of this size and complexity into the pre-existing buildings of a resort city has been a difficult one which the Army has in general accomplished with great speed and efficiency. In addition to garages, storage houses, department stores, casinos, and sundry other buildings, it has been necessary to requisition about 85 large and small hotels for student billets, about 65 villas for staff and faculty billets, and enough other space in hotels, villas, etc. for about 100 classrooms and laboratories and some 60 offices. There is also space for a library seating about 400 persons, a theater, a music hall, recreation halls, a gymnasium, clubs, etc. In order to provide other necessary services there are two dispensaries, a field hospital, sales stores, a shoe shop, cleaning and laundry shops, a bicycle shop (with about 700 bicycles), and numerous other aids to efficient and comfortable living. The total personnel of the installation, in addition to 4,000 students and about 275 faculty members, includes the station complement, several British Civilian Volunteer secretaries, numerous French civilian secretaries, clerks, waiters and cooks, and a labor battalion of German prisoners of war. In a school community at home the university organization does not include all persons serving the student body in any way, as it must in an independent installation in a foreign country.

Personnel

The *Academic Division* is headed by a director, Col. E. B. Thompson, whose role is similar to that of the executive vice-president or dean of the university in some schools in the States, and who is directly responsible to Gen. McCroskey. John Dale Russell, who is academic adviser on the Special Staff and has direct access to the Commandant, is usually referred to as "Dean" and is chiefly responsible for academic policies, working in close cooperation with Col. Thompson. Dean Russell's executive officer is Lt. Col. Frances H. Horn, and Col. Thompson's staff (with Lt. Col. F. C. Macomber as executive officer for the first term) consists of Maj. L. C. Pettit, Capt. W. A. Poirier, and Lt. R. W. Richey. Under the "two-headed" system which in this case works very well, the Academic Division is divided into eight sections and a total of nearly 40 branches which correspond to departments in the usual American civilian organization.

The Science Section of Biarritz American University had, at the close of the first term, a total strength of 70 persons; the Science Section chief, 5 branch heads, 45 instructors, 12 assistant instructors, and 7 secretaries who are British Civilian Volunteers. The

personnel of the Section, exclusive of secretarial help, is as follows:

Section office: Stanley A. Cain, chief; *Biology Branch*; Thomas H. Bissonnette, head; Benjamin R. Coonfield, Capt. Cyril J. Corum, Earl A. Dennis, Capt. Alvin R. Grove, Jr., Charles E. Hadley, Walter N. Hess, and Maj. Lincoln C. Pettit, instructors; T/3 Wendell T. Blight, Pfc. Wilbur L. Bullock, Pfc. Ernest Johnson, Cpl. James O. Maher, and Pfc. Marvin C. Martin, assistant instructors; *Chemistry Branch*: Andrew J. Scarlett, head; Maj. Perley D. Baker, Gladstone B. Heisig, Matthew L. Holt, Martin Meyer, Lt. Col. A. G. Siverson, and Lee F. Supple, instructors; M/Sgt. Nevis E. Cook and T/4 David R. Gross, assistant instructors; *Geology Branch*: Jesse J. Galloway, head; Armand J. Eardley and 1st Lt. Gerald M. Stafford, instructors; T/3 Max G. White, assistant instructor; *Mathematics Branch*: Joshua I. Tracey, head; T/Sgt. Elwood F. Arndt, Frank Ayres, Jr., Frederick R. Bamforth, Isaac A. Barnett, Lt. Col. Alonzo C. Cohen, Jr., Pfc. Samuel D. Conte, T/5 Jack C. Gibson, Lester S. Hill, Capt. Andrew O. Lindstrum, Jr., Raymond B. McClenon, Edward R. C. Miles, John H. Neelley, Alfred L. Nelson, 1st Lt. Stephen Oselinsky, Cecil G. Phipps, Joseph C. Polley, Bernhard P. Reinsch, Capt. Walter T. Scott, Charles R. Sherer, Gabor Szego, 1st Lt. Harold E. Temmer, Herbert S. Thurston, Lt. Col. Adlai S. Turner, and Roy M. Winger, instructors; *Physics Branch*: Paul R. Gleason, head; Maj. William M. Barrows, Jr., G. Harvey Cameron, Maj. Sherman W. Eager, Ralph B. Kennard, Wendell H. Kinsey, and Jefferson S. Meares, instructors; Pfc. John S. Winston, assistant instructor.

One question that arises in connection with a temporary institution such as Biarritz American University is that concerning the quality of the instructional staff. The only good answer to such a question arises from a familiarity with performance under a given set of conditions, but certain statistics are suggestive. Leaving out of consideration the 11 assistant instructors who are all military men, comparatively young, and assigned by the Army to BAU for duty, there are 51 "professors" in the Science Section, of whom 34 are civilians and 17 are Army officers and enlisted men. Thirty-nine of the science staff have the doctoral degree and, of the 12 who do not, 8 are military men who for the most part had their graduate study interrupted by the war.

The University of Chicago leads the list of institutions from which the Ph. D. was obtained, with four each in biology and mathematics and one in physics. Harvard, Yale, Cornell, Columbia, and Wisconsin are each represented on the science faculty by three of their Ph. D. graduates. Represented by two Ph. D. graduates each are Princeton, Indiana, Johns Hopkins, Illinois, and Rice Institute, and by one each, Michigan, Minnesota, Ohio State, California Institute of Technology, and the University of Vienna.

The 34 civilians were recruited for service at BAU directly from academic institutions in the States. Eleven of the military men are also on leaves of absence from similar institutions, and only 6 of the younger men are without school connections at home. The 51 professors of the BAU Science Section held various academic ranks in 42 different institutions before entering Army service. Two-thirds of them hold the rank of professor at their parent schools, one-half of these being also department heads. Schools represented on the BAU science faculty include: Alabama Polytechnic Institute, University of Alabama, American University, Arkansas Polytechnic College, Brooklyn College, Carnegie Institute of Technology, University of Cincinnati, Colgate University, Connecticut College, Dartmouth College, Dickinson College, Duke University, Florida Southern College, Florida State College for Women, University of Florida, Grinnell College, Hamilton College, Hunter College, Illinois Institute of Technology, Indiana University, Leland Stanford University, University of Michigan, University of Minnesota, Montclair State Teachers College, North Carolina State College, Northwestern University, Norwich University, Ohio State University, Oklahoma A and M College, Pennsylvania State College, University of Tennessee, Texas Christian University, University of Texas, Trinity College, Wabash College, University of Washington, Washington and Lee University, Wayne University, Western Reserve University, Wilson Teachers College, and Yale.

It is apparent from the foregoing statistic that the faculty of BAU (and the Science Section is perhaps typical of the whole) has an average academic qualification that excels that of the usual institution of its size in the States. A partial explanation is that the civilian recruits had to be at least 42 years of age and to have established reputations as successful teachers. A second explanation of the excellence of the BAU faculty is the care and good judgment of the military men and their civilian advisers who have worked since shortly after V-E Day on the problem of personnel procurement.

Another question in connection with the personnel problem is that of the willingness of the teachers to work in war-torn Europe and of the colleges and universities to release much-needed staff members. The principal answer to this question, I believe, also lies with the good efforts of members of the procurement staff, who not only made work with the American Army universities attractive, but who also convinced the candidates of the soundness and worth of the program. V-E Day was passed, and V-J Day was in the uncertain future. Teachers knew something of the conditions of war and the need of the soldiers for the type of transitional experience from war to civilian life which good American schools in Europe could provide, and several of them had served in World War I and taught in Army schools at that time. Many of them had taught recently in the Army Air Forces and Navy college training programs and desired to do more for the war effort and the soldiers.

Curricula

The 37 course offerings in science for the second term, which include only minor changes from the first term, are as follows:

Biology Branch: General Biology, Botany I (structures and functions), Botany II (survey), Plant Classification, Bacteriology, Genetics, Zoology, and Physiology; *Chemistry Branch*: Introductory General Chemistry, General Chemistry Review, Qualitative Analysis, Organic Chemistry, and Physical Chemistry; *Geology Branch*: Physical Geology, Historical Geology, Geomorphology, Structural Geology, and Field Geology; *Mathematics Branch*: Intermediate Algebra, College Algebra, Higher Algebra, Plane Trigonometry, Spherical Trigonometry and Astronomy, Plane Analytical Geometry, Advanced Analytic Geometry, Differential Calculus, Integral Calculus, Ordinary Differential Equations, Mathematics of Finance, and Higher Mathematics for Engineers and Physicists; *Physics Branch*: Nature of the Physical World, Introductory College Physics, General College Physics (mechanics, heat, and sound), General College Physics (magnetism and electricity, light, and modern physics), Atomic Physics, Magnetism and Electricity, Mechanics, and the Physics of Weather.

For the first term the Science Section taught 1,805 students in 96 classes with an average class size of less than 19 students. The second term enrollment is 1,946 in 105 classes with an average class size of 18.5.

The normal student load is three courses meeting daily, Monday through Friday. Teaching of three classes is also considered the normal faculty load. In some cases this means 15 contact hours a week, and most classes are rated at 40 contact hours for the eight-week course. In some of the sciences the credit units are increased to 4 and the weekly contact hours to 8 or 10. Two such courses are considered a full load for both students and teachers. Section chiefs and Branch heads carry a reduced teaching load because of their administrative duties. There is an orientation, advising, and counseling system which serves the students at registration and subsequently during the term. The official Faculty Advisers were relieved of teaching one class because of this duty. In general, the advising system has worked well by giving the students every aid while judiciously allowing them freedom and responsibility in determining their selection of courses.

Special Educational Opportunities

Although inadequate on the day of the opening of the first term, classroom and laboratory furnishings were soon available and satisfactory, if not complete, standard, and elegant. A good amount of proverbial Yankee ingenuity went into laboratory improvisation. Ordinary Army supply stocks, sources, methods, and personnel were inadequate to handle the unique and tough problems of academic supply, such as obtaining living organisms and prepared biological materials, chemicals rare in the European Theater of Operations, fossils and rock specimens, apparatus for mechanics, etc. In addition, processing of requisitions, transportation and other delays at first caused serious deficiencies in teaching materials. In some cases exploration and hand processing were quickly learned by the civilian instructors, and, aided and abetted by some officers, they were able to obtain equipment and supplies for biology, chemistry, and physics that never would have been obtained through "channels," or only after long delays. Three instructors, representing chemistry, biology, and physics, spent several days in Germany in the area between Frankfurt and Stuttgart, obtaining useful materials from captured medical dumps; and the physicists were able, by personal visits, to get for BAU many items from Signal Corps depots and other Army sources around Paris and Marseilles. In biology and geology, staff members were appointed collectors and by daily field work were able to obtain from the Basses Pyrénées district many excellent teaching materials. As a matter of fact, the use of such methods is standard at some institutions at home and enhances the value of a course. Textbooks have been a problem in several courses. Usually the books available have been the Education Manuals and Army Textbooks already in ETO. Some classes went through the first term either with no textbook at all or with a limited number on reference in the Library. The Library has steadily increased the number and usefulness of the items it contains. At the close of the first term there was a total of about 7,000 items available for student and staff use.

There are some advantages in the teaching situation at BAU that are noteworthy because they frequently do not exist at home. The biologists have made good use of the seashore, conducting some classes on the beach and obtaining laboratory materials from the sea. They also arranged for generous use of the very excellent local Musée de la Mer, not only for students in biology classes, but also for all members of BAU, with a naturalist-interpreter present as guide one day a week. The shortage or lack of preserved or prepared materials caused a desirable usage of living materials in biology. The geologists also found the Museum useful and have enriched their courses by collection of local rocks, minerals, and fossils. The chemists have utilized local industries by conducting tours to superphosphate and lead-chamber sulphuric acid plants, to open-hearth steel plants, blast furnaces, and coke ovens. In several instances, contacts have been made with French scientists which have resulted in enrichment of the teaching program at BAU. An extraordinarily capable and helpful Visual Aids Branch, attached to the Academic Division, has prepared wall charts and tables, still and working models,

and apparatus that equals or excels similar materials available in the States. This Branch has also shown numerous instructional movies for the classes. For example, Biology used 14 different films for a total of nearly 100 runs during the first term. One of the finest and most unusual features of the BAU teaching program is the extensive use of motor transportation. Jeeps, weapons carriers, two-and-a-half-ton trucks, and personnel carriers were made available for staff reconnaissance of the area, collecting, and conducted class trips, both during regularly scheduled class periods and on week ends. During one five-week period about 250 such trips were scheduled, and in one week about 60 such trips went out, approximately 1,000 students being accommodated. In the Academic Division as a whole, the Agriculture, Engineering, and Science Sections were the heaviest users of motor transportation, but Liberal Arts, Fine Arts, Journalism, and Commerce conducted some field trips with such diverse objectives as painting, the study of local flora, Basque villages, power installations in the Pyrénées, and sites of discovery of relics of prehistoric man.

The members of the BAU faculty are receiving beneficial experiences which will be reflected in their professional work and benefit their institutions. Although the course offerings have been mostly at the Lower Division level, there have been some advanced classes with highly qualified and stimulating student personnel. The Faculty has generally been impressed with the earnestness of the soldier students and their ability quickly to make the necessary adjustments from the military to the civilian patterns of thought and behavior. Although most of the soldiers have been away from the classroom atmosphere for from two to several years, they nearly all get back into the swing of it within two weeks. The anticipation of difficult psychological adjustment problems and the extensive planning and worrying on the part of educators at home as to what to do with the returning soldier have been unnecessary except for a very small percentage of men. The BAU teachers, on returning to their parent institutions, will be in an excellent position to assist their colleagues and administrators.

To any professor, whether or not he had been to Europe before, a chance to spend several months in France and, especially, to see firsthand some of the effects of the war and occupation was an inducement to accept the invitation to join the BAU faculty. Furthermore, the travel and foreign experience was to be without financial loss, for the Army contracts were so drawn that the teacher received his base pay plus 25 per cent for overseas duty and subsistence. Firsthand contacts with the French landscape and natural features, with industry and business, with the people and their conditions of life, and with French educators, scientists, and artists, offered the prospective instructor at BAU a strong reason for accepting the academic adventure.

Our military administration has made it possible for many of the professors to have additional experiences of great value to them. Between the first and second terms nearly everyone was allowed to leave Biarritz and to spend a period of approximately seven days on temporary duty at some point of interest. The majority accepted duty at Paris or London, with considerable freedom of movement at their destinations and with transportation and subsistence furnished. Some joined the regular Army tours of Switzerland or took hiking trips in the Pyrénées. One group of professors, as guests of the Ninth Air Force, toured Germany giving a series of lectures to the soldiers on subjects as diverse as the atomic bomb, the future of small business, and the contemporary American novel. Others attended the Congrès de la Victoire of the Association Francaise pour l'Advancement des Sciences. At the time of this writing, plans are being made for an American Week in the Netherlands early in December when about 40 professors from Biarritz American University and Shrivenham American University will deliver over 100 papers on recent advances in their fields. This goodwill congress will help our Dutch friends fill the void produced by more than five years lack of contact with scientific and other developments in the States. Such experiences are of inestimable value to the American educators who participate. They also do much to reassure our European colleagues, who have suffered and lost so much, that there is an internationalism and fraternity of science and scholarship.

The primary objectives of the Army in the establishment of the universities abroad were to develop institutions as nearly as possible like the usual civilian university of the United States to help the soldier awaiting redeployment (to the States or, at that time, to the Pacific Theater) make adjustments to civilian life while spending his time profitably. These objectives, in the opinions of both the students and the faculty, have been attained to a high degree through the institution which is briefly described above, and because of the reasonableness, the common sense, and cooperation of the military and civilian staffs, and the complete academic freedom which the Army has given the faculty. As far as academic credits are concerned, there seems little doubt that registrars will accept the course work done here by the students at its face value. But of far more significance are the wholesome lack of overconcern with credits, the desire to learn for its own sake and prepare for a new life

Science Legislation

Domestic Control of Atomic Energy

Howard A. Meyerhoff

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From the standpoint of scientific achievement, the war's climax came with the atomic bomb. It was inevitable that such a devastating weapon should arouse mixed feelings of alarm and admiration for the brains which conceived it and for the nation that had the ingenuity to produce it and the audacity to use it—daringly, but with telling effect.

When the first bomb exploded in New Mexico, it ceased to be the possession of scientists and became a problem of the nation. When the second bomb exploded over Hiroshima, it was no longer a national problem but a matter of international concern. Inevitably the journalists took possession of it, and politicians and statesmen quickly followed suit. The lay public can talk almost as intelligently as scientists themselves on the principles of the bomb and on its potential implications to all mankind.

Legislation designed to develop and also to control the use of atomic energy was inevitable, and three bills have been introduced into Congress with this general purpose. S. 1463 (known as the May-Johnson Bill), S. 1557 (the Ball Bill), and S. 1717 (the McMahon Bill) are now before the Senate, and it is desirable that scientists know not only the provisions of the separate bills, but specifically the points wherein they differ. In so far as scientists are concerned, there are important and serious questions to be faced and to be decided. So powerful a weapon as atomic energy calls for restriction of use, and restriction of use in turn demands certain restrictions upon freedom of research and freedom of publication.

The major differences of opinion among individual scientists and between scientists and members of the Government were featured, with some distortion, in the press when the hearings on the first two of these bills were held. It is not the purpose of this brief article to favor any one of the bills presented here, but rather to offer the readers of *Science* an analysis of the three bills as a basis for the formulation of sound judgment.

Fortunately, such an analysis has been prepared in chart form by Senator McMahon and his staff. This comparative summary is reproduced herewith with the permission of his office.

Comparative Summary of Key Senate Bills

for

Domestic Control of Atomic Energy

S. 1717 (Senator McMahon)	S. 1463[1] (Senator Johnson)	S. 1557 (Senator Ball)
I. Control of Atomic Energy in General		
Bill incorporates specific policy decisions on nature and extent of Government control. Commission's powers are specifically tailored and limited to these decisions.	Bill incorporates no specific decisions on nature and extent of Government control. Commission's powers are adequate, but broad enough to permit the extremes of either too great or too little Government control.	Bill incorporates no specific decisions on nature and extent of Government control. Commission is given authority to "control" raw materials, production, and finished active materials with no implementing provisions.
A. *Production of Fissionable Materials*		
Commission to have monopoly of production of fissionable materials. Production in minor quantities incident to research permitted subject to frequent inspection and reports.	Commission permitted to authorize private production of fissionable materials.	Commission permitted to authorize private production of fissionable materials.

[1] The so-called "May–Johnson Bill" as introduced. After amendment by the House Military Affairs Committee the bill was reported out as H.R. 4566.

S. 1717	S. 1463	S. 1557
	B. *Fissionable Materials*	
Exclusive Government ownership of fissionable materials but to be made available for research and licensees (see E) for use in devices.	Private ownership of fissionable materials permitted. Commission may permit *any* private use of fissionable materials (see E).	Private ownership of fissionable materials permitted. Commission may permit *any* private use of fissionable materials (see E) but required to allocate for peaceful and military uses.
	C. *Source Materials*	
Commission licenses movement of ingredients essential for production of fissionable materials to assure adequate supplies and prevent diversion inconsistent with national welfare. Commission has authority to buy or condemn.	Commission's only authority over source materials is power to buy or condemn.	Production, sale or allocation of source materials unlawful unless authorized by Commission. Commission to allocate for peaceful and military uses.
	D. *By-product Materials*	
Commission shall distribute for constructive uses, giving preference to research and medical therapy.	Commission may dispose of by-product materials as it sees fit.	See B. By definition, by-product materials are treated same as fissionable materials.
	E. *Atomic Energy Devices* (i.e. *devices utilizing fissionable materials)*	
Use not permitted until after report to and opportunity for Congress to legislate on the basis of specific knowledge of utility, practicability, and consideration of economic, political and social implications of marketing such devices. Licensing of atomic energy devices for private use permitted if Congress fails to act in 90 days but such licenses may not extend to the production of fissionable materials.	Commission has broad authority to license any private use (including power, heat, transportation, when and if feasible), whether or not fissionable materials are produced incident to such use.	Operation of private devices not prohibited unless pursuant to authority to "control." Commission has broad authority to license any private use whether or not fissionable materials are produced incident to such use.
	F. *Patents*	
1. All private patent rights on production processes must be sold to Government (see A). 2. Private patents on devices utilizing fissionable materials permitted subject to compulsory licensing at reasonable royalty rates determined by Commission. (Subject also to E above.)	No specific provision on patents. Commission may buy or condemn private patents or may permit their restrictive use.	No specific provision on patents within general authority to "control" production and "finished active materials."
	II. Stimulation of Research and Development	
Research responsibility and powers of Commission include social, political and broad economic effects of atomic energy developments, as well as military, industrial and scientific research aspects.	Research responsibility and powers of Commission limited to military, industrial, and scientific research.	Research responsibility and powers of Commission limited to atomic energy research.
	A. *Independent Research*	
1. No license or permission from Commission required to do research. Private research must comply with safety regulations, and be subject to inspection.	1. If research involves release of atomic energy in amounts militarily or industrially significant, permission from Commission must be obtained and research will be subject to conditions prescribed by Commission.	1. License required for research; to be issued only to qualified organizations. Shall be revoked if research is not competent or waste of materials. Conduct of research must comply with safety regulations.
2. Commission shall give preference to independent research in allocating fissionable materials (see I B).	2. Commission has authority to license the use of Commission-owned fissionable materials for private research (see I B).	2. Commission shall allocate fissionable materials for private research to competent applicants upon finding that purposes of research are consistent with Act.
3. Provides for grants-in-aid, contracts and other forms of assistance.	3. Provides for grants-in-aid, loans and other forms of assistance.	3. Provides for grants-in-aid, contracts and other forms of assistance.

S. 1717	S. 1463	S. 1557
	B. *Dissemination of Information*	
1. *Basic scientific information* is free of restriction. 2. Commission is directed to provide for dissemination of *related technical information* with utmost liberality. Commission by regulation may free such information from all restriction, or, with approval of President, may restrict its dissemination on finding that Espionage Act is applicable. 3. Scientists work under Espionage Act as in peacetime and may, if they desire, obtain clarification of the Espionage Act by action of Commission. Subject only to regular criminal prosecution under Espionage Act.	1. Commission given full authority to & issue restrictive regulations (over 2. and above Espionage Act) on dissemination of scientific information, with criminal penalties for violation. 3. Commission may direct the dismissal of any scientist from public or private employment if Commission believes him to have violated security regulations, without regard to criminal prosecution or conviction therefor.	1. No security regulation to be issued affecting fundamental research. 2. Security regulations on military research and military utilization may be issued by Secretaries of War and Navy, and approved by Commission. Criminal penalties for violation. 3. Scientists work under Espionage Act and security regulations issued under 2.
	C. *Government Research*	
Commission authorized to conduct any type research related to purposes of Act. Takes over Manhattan District Property.	Commission authorized to conduct research but is directed to make maximum use of private and other Government research facilities. Takes over Manhattan District Property.	Commission authorized to develop its own facilities for research only if existing private and Government facilities are inadequate. Takes over Manhattan District Property.
III. Integration with Foreign Policy in General		
Bill emphasizes peacetime uses of atomic energy. Provides affirmatively for dissemination of information to create atmosphere of international confidence. Provides for anticipation of long-range developments through social, political and economic studies. Provides for all-civilian administration of the Act.	Bill emphasizes military uses of atomic energy. No provision for dissemination of information other than restrictive security regulations. Permits military membership on Commission and members of armed forces on active status to serve as Administrator and Deputy Administrator.	Bill contains emphasis on neither military nor peacetime aspects. Provides for free dissemination of fundamental scientific information and limits security regulations to the military field. Provides for two military members of Commission.
	A. *Bombs and Military Weapons*	
1. Manufacture permitted only if express approval of President obtained for each quarter. No private or military manufacture permitted. 2. Commission has custody of all bombs and military weapons subject to direction of President. 3. Commission may not conduct research in military uses of atomic energy contrary to international agreement.	1. No specific provision on bomb production. Commission may manufacture as it sees fit, or authorize manufacture by the military or by private concerns. 2. No specific provision on custody of bombs. Either the Commission or the Armed Forces may have custody. 3. Commission is directed to conduct research for the exploitation of atomic energy for military purposes. No reference to international agreement.	1. No specific provision on bomb production. Uncertain whether Commission permitted to manufacture but no limitation on manufacture by Armed Forces. 2. No specific provision on custody of bombs. 3. Army and Navy conduct military research with Commission serving in advisory role. No reference to international agreement.
	B. *Preservation of Freedom to Act Internationally* (See A *re* Bombs)	
1. Government monopoly of production prevents creation of private interests which might be inconsistent with or deter international agreement. 2. Prohibition of atomic energy devices (see I E) prevents private activities which might be inconsistent with or deter international agreement.	1. Private interests in production of fissionable material may be created. 2. Private operation of devices (power plants, etc.) permitted.	1. Private interests in production of fissionable material may be created. 2. Private operation of devices permitted.
	C. *International Control of Fissionable Materials*	
1. Private export or import of fissionable materials forbidden. 2. Private participation in production of fissionable materials in another country forbidden.	1. Commission may permit private export or import of fissionable materials. 2. No specific provision on foreign production of fissionable materials.	1. No specific provision on export or import of fissionable materials. 2. No specific provision on foreign production of fissionable materials.

S. 1717	S. 1463	S. 1557
	IV. ORGANIZATION	
	A. *Structure*	
Bill creates five-man Commission, all members serving full-time. Four subordinate Directors to have functions as assigned by Commission. Express provisions against conflict of interests.	Bill creates nine-man Commission, all members serving on a part-time basis. Administrator and Deputy Administrator. Administrator given powers fully as broad as those of Commission.[2] Commission members exempted from statutes prohibiting dealings with Government by Government employees.	Bill creates nine-man Commission consisting of five Cabinet members and four public members. Public members serve on a part-time basis. Administrator and Deputy Administrator function under direction of Commission.
	B. *Appointment and Removal*	
1. Members of Commission and four Directors appointed by President.	1. Members of Commission appointed by President. Administrator and Deputy Administrator appointed by Commission.	1. Four public members of Commission appointed by President. Administrator and Deputy Administrator appointed by Commission.
2. All must be civilians.	2 All may be members of the Armed Forces.	2. Neither public members nor Administrator nor Deputy Administrator may be members of the Armed Forces.
3. All serve at pleasure of President.	3. Members of Commission appointed for nine-year terms. Removable only for cause.	3. Public members of Commission appointed for six-year terms. No restrictions on President's removal authority.

[2] H.R. 4566 makes Administrator clearly subject to directions of Commission.

Association Affairs

The Science Writers Annual Award

The George Westinghouse Science Writing Award Fund, to give national recognition to newspaper writers and newspapers contributing most to better popular understanding of the achievements of science and technology, has been announced by Dr. F. R. Moulton, permanent secretary. The fund has been provided by the Westinghouse Educational Foundation, which is supported by the Westinghouse Electric Corporation, in commemoration of the 100th anniversary of the birth of George Westinghouse. The fund will be administered by the AAAS, Dr. Moulton said, "to help develop closer cooperation between scientists and news writers in keeping the public informed of scientific developments which more and more affect our lives in this atomic age."

The fund provides two annual awards: (1) a cash award of $1,000 to a newspaper writer for outstanding science reporting of the year; (2) a citation to the newspaper whose science news coverage in the preceding year is adjudged most complete and authoritative and most interestingly presented. In addition, there may also be awarded at the direction of the Awards Committee special citations in recognition of distinguished service in science journalism.

The first annual awards, covering the year 1946, w be made at the winter meeting of the AAAS in Dece ber 1946. Details of the judging and presentation awards will be made at the spring meeting of the As ciation in St. Louis, 27–31 March. Members of t Awards Committee which will administer the fu include: Dr. Anton J. Carlson, chairman of the Exe tive Committee; Dr. Otis W. Caldwell, general sec tary; Dr. Moulton; Watson Davis, director of Scie Service and a past president of the National Assoc tion of Science Writers; Robert Potter, science edit of the *American Weekly* and a founder of the N tional Association of Science Writers; Dr. Mor Meister, principal of the Bronx (New York) Hi School of Science; G. Edward Pendray, public re tions counsel; and James A. Baubie, public relati director of the Westinghouse Electric Corporation.

"Heretofore," said Dr. Moulton, "prizes, medals, a citations in the fields of science have been given o for distinguished scientific researches or for contri tions to scientific theories. The science writing aw is something different from previous recognitions contributions to the advancement of science. It will an award for superior science writing for lay reade

Technical Papers

Sterility Induced in Growing Rats on a Tryptophane-deficient Diet

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While conducting experiments to determine the rate of recovery[1] of growing rats after being fed various deficiency diets, the author discovered somewhat different results in the case of the tryptophane-deficient animals. When they reached maturity, all the rats who had lacked this essential amino acid in their diet were found to be sterile. Since only one brief reference to such an occurrence could be found, and this with regard to male rats only, a further study was instituted, and its results are reported herein.

Throughout the entire project, albino rat pairs ranging in age from 28 to 48 days were used for experimental subjects, and in each case a pair of litter mates was used for controls. The experimental animals were fed a deficient diet[2] similar to that of Albanese and Buschke (*1*) for periods ranging from 3 to 18 days and then returned to the colony diet[3] which was fed the controls throughout the investigation.

In all cases the original matings were observed until the animals were at least 100 days old, by which time all but one of the control pairs had produced a litter. Since there had been no evidence of any sexual interest between the experimental pairs during this period, they were separated and mated to controls which had been proven fertile. The 38 deficient control crosses were observed for 90 days, and since there was no evidence of coitus, all but 10 of the matings were sacrificed and their gonads and pituitary removed for histological observation. The remaining animals were observed for an additional 60 days, and when they too were shown to be sterile, they were sacrificed as were the others.

The observations reported here show rather conclusively that growing rats, when fed a diet lacking tryptophane, even for as short a period as 3 days, manifest sterility, and that both sexes are affected similarly. This, furthermore, lends support to the belief that this amino acid has numerous specific actions in addition to aiding in the synthesis of body proteins. Further observations should show whether this specific action is on the gonads directly or through some other organ indirectly.

[1] Rate of recovery as used here refers to the time necessary for a deficient animal, after being returned to a normal diet, to equal the relative length and weight of its litter mates reared entirely on the normal or control diet.

[2] The exact composition of the diet was as follows: potato starch, 40 grams; bacto-gelatine, 30 grams; sucrose, 10 grams; olive oil, 10 grams; castor oil, 5 grams; and basic salt mixture, 5 grams. The salt mixture was composed of: NaCl, 1.73 grams; $MgSO_4$, 5.45 grams; K_2HPO_4, 9.54 grams; $CaH_4(PO_4)_2 \cdot H_2O$, 5.40 grams; Na biphosphate, 3.47 grams; Fe citrate, 1.18 grams; Ca lactate, 13.00 grams.

[3] The colony, or control, diet consisted of Friskie's Dog Food supplemented twice weekly with lettuce leaves.

Reference

1. ALBANESE, A. A., and BUSCHKE, W. *Science*, 1942, **95**, 585.

The Effect of Environmental Temperature on Mouse Susceptibility to Poliomyelitis Virus

D. FRANK HOLTMAN
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Environmental temperatures have been shown experimentally to play a significant role in modifying resistance to infectious disease of bacterial origin (*1*); hence, an investigation was made to determine whether environmental temperature affects the course of a virus disease, such as poliomyelitis. The virus was obtained from Dr. John F. Toomey, Western Reserve University, Cleveland, Ohio.

For the test, three groups of mice were acclimated to temperatures of 13° C., 22° C., and 32° C. Although referred to as a group, the mice held at 13° C. were kept in small cages, six to a cage, to prevent too much huddling. Three-week-old mice of relatively uniform weight (13–15 grams) were employed, and each group was held at its respective temperature for three weeks. Thus, the mice were six weeks old when finally tested for susceptibility to the virus.

After becoming acclimated to a given temperature, all the mice adapted to that temperature were subdivided into six groups. Three of the subgroups received intracerebral injections of 0.05 ml. of a 3-per cent infected brain-cord suspension. The remaining subgroups served as controls. One infected and one control group were kept at each of the three experimental temperatures, regardless of the temperature to which they had been originally adapted.

The mice acclimated to 13° C. and held at that temperature after inoculation never showed symptoms of paralysis in less than 11 days, with 13 days being required to establish 50-per cent mortality. In contrast to this, mice adapted to 22° C. and held at that temperature after injection showed 50-per cent mortality

at the end of seven days, and mice acclimated to and held at 32° C. began showing symptoms and dying as early as the fifth day. The mice originally acclimated to 13° C. and kept at 22° and 32° C. after injection showed greater susceptibility than those allowed to remain at 13° C. Conversely, mice originally adapted to 22° and 32° C. exhibited a greater resistance to infection, as indicated by a prolonged incubation period, when kept at 13° C. than when held at the temperatures to which they had first been acclimated (Table 1). Brain-cord material recovered by sacrificing some of the infected mice and treated with a known poliomyelitis virus neutralizing serum lost its infectivity.

TABLE 1

THE EFFECT OF ENVIRONMENTAL TEMPERATURE ON SUSCEPTIBILITY OF WHITE MICE TO POLIOMYELITIS VIRUS

Temperature to which mice were acclimated for 3 weeks prior to inoculation	Temperature at which mice were kept after inoculation with virus, numbers injected, and days elapsed before appearance of symptoms and mortality in 50 per cent of each group*					
	13° C.		22° C.		32° C.	
	No. mice	Incubation	No. mice	Incubation	No. mice	Incubation
13° C.	48	13 days	48	9 days	12	7 days
22° C.	48	9 days	48	7 days	12	6 days
32° C.	12	9 days	12	6 days	12	5 days

* All experimental groups were controlled with noninfected mice that received the same environmental treatment.

Since the experiment was repeated several times, mice from the same source were not always available. This, however, did not appear to alter the course of infection. Other factors, such as weight, feed, and dosage of virus were kept relatively constant. Hence, environmental temperature must be considered as the major factor contributing to the variation in incubation periods.

In view of the fact that metabolic rates tend to increase upon exposure to cold and decrease at higher temperatures, the data collected in this investigation could be interpreted as indicating the rapid growth of the virus, and the resulting symptoms of disease to be dependent upon a disturbance of the normal metabolic rate of the host. If the data under discussion could be applied to the human, one might assume that among occupants of temperate zones the shift from cool temperatures of the spring to the heat of summer creates an added susceptibility, not only through much greater opportunity for exposure to virus, but also through a decrease in the metabolic rate of the host, a condition possibly favoring rapid growth and spread of virus through the tissues of the host. Likewise, increases in the metabolic rate brought about with the onset of cooler temperatures of the autumn might interfere sufficiently with virus growth to lengthen the incubation period and permit certain infected individuals to develop resistance before exhibiting definite symptoms of poliomyelitis. It might even account for sporadic cases of the disease occurring in winter as a result of late summer infection and a prolonged incubation period. In advancing this concept, one would have to assume the need for a relatively gradual environmental temperature change, since work done on monkeys (*2*) has shown that the shock induced by sudden exposure to extreme cold after infection actually increases susceptibility, as well as the severity of the disease.

If one were to accept the thesis that a decrease in the metabolic rate creates an optimal condition for the growth of the virus and thereby increases host susceptibility, it would be difficult to explain why poliomyelitis is not more prevalent in the tropics and also why adults with their lower metabolic rates are not more highly susceptible than children. While it is true that poliomyelitis occurs in tropical regions, it seems seldom to assume the epidemic proportions so common in temperate zones during summer months. With regard to the susceptibility of children, it must be borne in mind that poliomyelitis is most prevalent in the five to nine age-group. These are not only the years when exposure may be relatively easy, but also constitute the period when the metabolic rate is declining rapidly after reaching a peak at approximately age five. Thus, the possibility of a "critical" or optimal metabolic rate of the tissues for virus growth being more readily obtainable between the ages of five and ten cannot be ignored. Even though any change in metabolic rate of the tissues as a result of external temperature variations may be very slight, possibly only that slight disturbance of normal metabolism is required to promote increased susceptibility or resistance. In other words, seasonal temperature fluctuations and the resultant metabolic disturbances, particularly toward a decrease in the metabolic rate, might be considered as being more conducive to susceptibility than prolonged exposures to relatively high, yet stable, temperatures.

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Scanning Science—

The so-called Liebig's condenser was not devised by Liebig, but by a student of medicine at Göttingen, Christian Ehrenfried Weigel. Liebig never claimed to be the inventor of his condenser, but describes it in his *Handbuch* (1843) as "der Göttlin'sche Kuhlapparat," while Göttling in his *Almanach* (1794) rightly ascribes its invention to Weigel, who was then professor of botany and chemistry at Greifswald.

—28 February 1896

News and Notes

Dr. Carl M. Stevens, formerly research associate in the Department of Biochemistry, Cornell University Medical College, is now assistant professor of biochemistry in the Department of Chemistry, State College of Washington, Pullman.

Dr. Harry W. Karn, recently released from active duty in the Navy and formerly assistant professor of psychology at the University of Pittsburgh, has been appointed assistant professor of psychology in the Division of Humanistic and Social Studies at the Carnegie Institute of Technology, Pittsburgh.

Prof. Raymond Delaby, general secretary of the Société Chimique de France, has been appointed to the general secretaryship of the International Union of Chemistry, succeeding Dr. Jean Gerard, whose term of office has expired. Prof. Delaby's address is 4, Avenue de l'Observatoire, Paris (6).

J. Casper Schwarz has resigned as assistant superintendent of Lambert Pharmacal Company to open a private consulting service to the cosmetic, perfume, and allied trades. Offices will be temporarily maintained at 4 Wakefield, Ladue, St. Louis County 17, Missouri.

Dr. John Romano, psychiatrist of the University of Cincinnati College of Medicine and director of the Department of Psychiatry, Cincinnati General Hospital, has accepted appointment as professor of psychiatry at the University of Rochester School of Medicine and Dentistry.

Announcements

The Manchester Guardian reports that J. D. Bernal addressed the Royal Institution in Manchester on 23 November 1945. Mr. Bernal said: "One of the characteristics of the new age is that you cannot take a step in any social or political scheme without involving yourself in highly technical and scientific questions. It does not mean that scientists claim to be the Government or to have any other statutory position. It only means that government and administration are impossible unless they are thoroughly scientific, in the sense of having people in control who know what they are doing. We are very far from that position today. But it is coming and it is one of the duties of the scientist to point out that this process must go on very rapidly if we are to escape in this country the position of being relegated to a relatively barbarian status."

The Department of Physics, University of Delaware, has recently received as a gift a Westinghouse mass spectrometer, valued at approximately $10,000, according to Dr. Vincent E. Parker, acting head of the Department. The far-reaching expansion of its research program in atomic physics which is planned by the Department will soon be greatly accelerated through the construction of a new $375,000 Physics Building, made possible through the generosity of the late Mr. H. Fletcher Brown, a trustee of the University. Research will be conducted in the fields of isotope separation and tracer research, using both stable and radioactive tracer elements. In addition, the mass spectrometer will be used in a program of cooperative research with the Department of Chemistry and with the Division of Chemical Engineering.

The University of Maryland has announced an additional gift of $800,000 from the Glenn L. Martin Company for its aeronautical engineering school. This gift supplements $1,700,000, given to the University by the Martin Company on 16 December 1944. The two gifts are to be used to establish the Glenn L. Martin College of Engineering and Aeronautical Sciences. The State of Maryland has appropriated an additional $750,000 for the same purpose.

Iowa State College has announced the establishment of a Tropical Research Center in Antigua, Guatemala, after two years of corn research and survey work by college plant and administrative specialists in Central America. Construction has started on the physical plant, and it is expected to be ready for operation by 1 July of this year. Research will be done there, and a limited number of graduate and undergraduate students will go to the tropics to study at the center. Research work will relate to the broader aspects of agriculture and the natural sciences, with the initial emphasis on maize and other plants known to be native to southern Mexico and Central America. The College will maintain a resident director and a small staff at the center during most of the year. This move by the College was made possible in part by a grant for basic research on maize and other cultivated crops by the May Seed and Nursery Company of Shenandoah, Iowa.

In establishing the center, the College is cooperating with the Hacienda Company of Guatemala City and the Guatemalan Ministry of Agriculture. The Hacienda Company is providing buildings to house the activities of the center and lands to be used for experimental plots, testing grounds, and gardens.

The Clinical Fellowships in Medicine offered by the American College of Physicians to provide further training for returning-veteran medical officers, are nearly exhausted. Because of the large number of applications on hand and pending, no further applications will be accepted after 1 February 1946 by the Office of the Educational Director, 4200 Pine Street, Philadelphia 4, Pennsylvania.

The Quarterly Review of Pediatrics is a new abstract journal published by the Washington Institute of Medicine, 1720 M Street, N.W., Washington 6, D. C. Dr. Irving J. Wolman, Philadelphia, is editor. The Editorial Board consists of Drs. Allan M. Butler, Daniel C. Darrow, Ethel C. Dunham, Harold F. Faber, Sidney Farber, Robert L. Gross, Clifford G. Grulee, Henry F. Helmholz, Sam Z. Levine, Hugh McCulloch, Donovan J. McCune, Irvine McQuarrie, Mitchell I. Rubin, Milton J. E. Senn, Joseph Stokes, Jr., Frederick F. Tisdall. The first issue will appear in February 1946. *The Quarterly Review of Pediatrics* plans to survey the current medical literature of this country and abroad and to abstract "as promptly as possible all articles of significance which deal with disease conditions, health, growth, and mental welfare, from infancy through adolescence."

The John Wallace Dallenbach Fellowship in Psychology, a graduate fellowship in memory of John Wallace Dallenbach, former Cornell student killed in action in 1944, has been established at Cornell University. The fellowship, applications for which will be accepted next fall, will provide up to $800 per year in addition to free tuition and may be held one year by a graduate student working in the field of experimental psychology. John Dallenbach was the son of Prof. and Mrs. Karl M. Dallenbach of Ithaca. He was but a few weeks away from his doctorate in psychology at Harvard when he entered the Service.

The Winthrop Chemical Company has extended for another two years its fellowship for the training of medical graduates in the teaching and research of pharmacology at the Stanford University School of Medicine, San Francisco.

Union College, Schenectady, has been given $10,000 by an anonymous donor to endow an annual full-tuition scholarship in chemistry.

The Association of College Geology Teachers held a meeting in Pittsburgh on 28 December during the meeting of the Geological Society of America. The conference in the GSA on training in geology, sponsored by Prof. C. R. Longwell, stimulated interest in the work of the Association, and several requests for membership were received. Any others interested may address the secretary, Miss Katherine Grea Hunt Oil Company, Midland, Texas, or the presid Dr. Percival Robertson, Elsah, Illinois.

New research laboratories will be erected on a 2 acre tract halfway between Akron and Cleveland n Brecksville, Ohio, by the B. F. Goodrich Compa The original research laboratory, first in the rub industry, was established in 1895 in Akron. The o standing characteristic of the new laboratories wil the adaptability for rapid conversion from one ty of work to another. Removable partitions, int changeable fixtures, and a wide variety of spe services will be employed. "It will be possible change the whole interior arrangement of most of buildings overnight. We can be engaged in exten carbon black research one day in a chosen space a within 48 hours be switched over to research on ter fibers, fine films, or plastics in the same laborat location," Dr. Howard E. Fritz, director of resear said in illustration. The building site was chosen p marily because of its freedom from dust, cross-coun electric lines, vibration, and noise. Quarantining vibration so that the most delicate operations can carried out has been a special objective, accountin for the separation of the laboratories into five buil ings and removal of the whole research project fr proximity to any industrial or manufacturing oper tions. At the outset of operations in the resear center the staff will consist of 220 to 250 persons.

A Sociedade Brasileira de Geologia was founded 27 December at a meeting of Brazilian geologists he at the University of São Paulo, under the auspices the Departments of Geology and Mineralogy of th University. Prof. Reinaldo Saldanha da Gama, he of the Department of Mineralogy and Petrograph presided, and Dr. Josué Camargo Mendes, assista professor of geology and paleontology, served as se retary of the organization meeting. Profs. Saldan da Gama; Octavio Barbosa, Cathedrático de Geologi Escola Politécnica, University of São Paulo; Kenne E. Caster, head of the Department of Geology a Paleontology, University of São Paulo; Djalma Gu marães, Cathedrático de Geologia, School of Min Ouro Preto; and Othon Leonardos, of Rio de Janeir were elected original fellows (socios efectivos) a were charged with the responsibility of selecti fifteen others. All subsequent fellows and membe will be elected by the fellowship. Through the kind ness of Dr. Jorge Americano, rector of the Universit of São Paulo, adequate private funds were secured t cover the costs of organizing the society and preli nary plans for a serial publication in geology. T first official meeting of the society will be held in la

February for the adoption of a Constitution and By-laws now being prepared by a committee comprised of Profs. Rui Ribeiro Franco, Rui Ozorio de Freitas, and Fernando F.M. de Almeida, all of the University of São Paulo.

A new series of research positions designed to make science as a career as attractive as the administrative field in industry has been announced by the Technical Division of the Rayon Department of E. I. du Pont de Nemours & Company. The new classifications, which are open to chemists, engineers, and other technically trained employees demonstrating unusual scientific ability, are specified by the titles of "junior research associate," "research associate," and "senior research associate." Salary rates correspond to those for supervisors, managers, and assistant research directors. Dr. E. B. Benger, manager of the Technical Division, has named three members of his staff to the new classifications. Dr. W. E. Roseveare, research supervisor in charge of the basic research group of the Viscose Rayon Research Section at the Spruance Plant, Richmond, Virginia, and Dr. E. F. Izard, Pioneering Research Section at the Yerkes Plant, Buffalo, New York, were appointed research associates. Dr. E. V. Lewis of the Nylon Research Section, Wilmington, became a junior research associate.

Senior research associates will be chosen from men of long service, distinguished scientific attainments, and high creative potential, with capabilities for originating, organizing, and conducting their own research programs. They will have substantial freedom in selection of work and in the selection of assistants. In addition, they will be encouraged to attend any scientific meetings in which they are professionally interested; to contact other laboratories and workers, both in and outside the company, and to publish scientific papers. As a general rule, research associates will concentrate in a single field and will have considerable latitude for exploratory work in unpredictable directions. The plan will roughly double the number of promotions toward which scientists in the Technical Division of the Rayon Department can aspire. Appointments are to be made gradually and only after men have qualified for an appropriate classification.

The Board of Regents of the State College of Washington has announced the establishment of the Washington State Institute of Technology and the Institute of Agricultural Sciences, as components of a far-reaching program of the State College in cooperation with the state-wide industrial and agricultural development program of the State of Washington. This announcement, of special interest in the Pacific Northwest, follows the completion of surveys undertaken by the Board of Regents during the past several months.

The Washington State Institute of Technology includes the College of Engineering, School of Mines, Engineering Experiment Station, Mining Experiment Station, State Electrometallurgical Laboratories, and the Division of Industrial Research and Extension, recently established at Washington State College under a broad charter and liberal grant from the State legislature last spring. The Board of Regents also authorized expansions in the scope of engineering instruction and research, including atomic power engineering. Dr. Paul A. Anderson, chairman of the Department of Physics, has been designated as acting director of the Institute of Technology pending the expected early selection of a permanent director, and Dr. H. E. Culver, chairman of the Department of Geology and former state supervisor of geology, as acting dean of the School of Mines and Mineral Industries. R. D. Sloan continues as dean of the College of Mechanic Arts and Engineering; Homer J. Dana, as head of the Engineering Experiment Station; and E. B. Parker, as director of the Division of Industrial Research and Extension.

The integration of the services of the State College in the Agricultural Sciences follows the recommendations of the dean of its College of Agriculture, E. C. Johnson, who continues in that capacity but requested to be relieved of the administrative responsibilities as director of the Experiment Station as of 1 January 1946 on the completion of 27 years in that position. The Institute of Agricultural Sciences will be headed by Dr. J. C. Knott as director and Dr. Mark Buchanan as vice-director in charge of Agricultural Research and Extension and director of the Washington Agricultural Experiment Stations. The Institute is expected to include, in addition to the College of Agriculture and the Experiment Stations, the Agricultural Extension Service, to be headed by E. V. Ellington, now vice-director of the Agricultural Experiment Stations; the College of Veterinary Medicine, headed by Dr. E. E. Wegner as dean; and, in the College of Home Economics, headed by Dr. Velma Phillips as dean, the research and extension activities pertaining to the Agricultural Sciences or supported by Federal and State Agricultural Experiment Station and Extension funds. Superintendent J. W. Kalkus, of the Western Washington Experiment Station, continues as vice-director of the Agricultural Experiment Station, of which Dr. S. P. Swenson, associate professor of agronomy and genetics, has been named as assistant director. These assignments were effective 1 January 1946 and will be completed as promptly as the necessary arrangements can be made.

At the same time the Board of Regents announced that, effective 1 January 1946, the general salary scale of the teaching faculty of the State College of Washington has been advanced, and that, with the exception of the research, extension, and administrative staff, the regular annual service period of members of the teaching faculty will hereafter be on the basis of 9½ months in place of the customary 11-month basis. It is expected by the Board of Regents that this arrangement will enable members of the faculty to engage more widely than heretofore in studies in other institutions, in travel, in cooperation with various industries and lines of commerce in the Pacific Northwest, and in professional consulting services, as well as in researches in the laboratories and libraries of the State College.

Conditions Abroad

Dr. Reinhard Dohrn, of the Statione Zoologica, Naples, has sent word to his friends in this country that the laboratory is becoming more active from month to month. He writes that "the fact that the Italian National Research Council chose the Station for establishing a 'Centro di studio per la Biologia' has helped very much to revive research life in the Institute. The group of research students who have been working with us since July acts as a catalyst in the recovery of the Station. In the same measure, however, as the activity of the laboratory increases, we feel more and more the isolation we are still living in, and the need of interchange abroad. We feel it all the more, as international contact was always a fundamental factor in the Station's life. The great problem here now is the want of many of the things one needs in normal laboratory activity. The common laboratory materials are either unattainable here, or at shocking black market prices. Above all, of course, the need of the recent literature is felt. So far, however, the existing trade and money exchange restrictions make it impossible to cover our needs by purchasing from abroad in the ordinary way. We have come to an arrangement with Switzerland by which the help they want to give us is offered in the form of goods if we choose. Thus, the money which they grant for the Table rent is kept at the disposal of the President of the Naples Table Committee, Prof. Baltzer, and is used in paying for the Swiss periodicals we subscribe to, and for the laboratory materials which we may order there. We came to this agreement to expedite recovery and to avoid the wasting of money on the black market here. The Legation very kindly agreed to help in the transportation. A similar arrangement is under way for the Table grant from Sweden (Profs. Runnström and Hörstadius). Since there are many American periodicals which we very badly need, and also laboratory equipment, I am wondering whether some sort of arrangement of that kind could be found for temporarily solving the problem of bringing up to date our library as far as American literature is concerned and eventually filling up gaps in our equipment. This would be for the Institute the first and most important step in becoming again an efficient international research center."

Prof. E. Faurè-Fremiet, Laboratoire d'Embryogenie Comparée, Collège de France, Paris, V^me^, France, has written by air mail to Profs. Robert Chambers and Morris Harnly that he is in great need of reprints and books published since 1939. At the moment he is preparing a monograph on the cell and requests from his American friends and colleagues reprints bearing especially on the fields of cytology, protozoology, and embryology. It is requested that scientists having such material mail it directly to him at the above address.

A letter regarding Japanese ichthyologists, dated 19 December 1945, has been received by Dr. Carl L. Hubbs, Scripps Institution of Oceanography, University of California, La Jolla. The letter follows verbatim:

How do you getting on during the war. Japan is quite defeated. Our Research Institute of Natural Resources and my home were destroyed on the night of 25th May of this year. But now we have new building to constitute the organization of our institute by the help of Maccasa. I am now connecting with the Fisheries Section of Natural Resources of Maccasa General and meeting Mr. J. L. Kask and J. Janssen for the fisheries of Japan. I hope you will come soon again to Japan and work together with us on Japanese fishes. Mr. [Katsuzo] Kuronuma is sick now but soon be better. Mr. [Kiyomatsu] Matsubara is a Professor of Fisheries Institute and carrying the study of fishes. At present we are very trouble to get the food in every day but must continue our scientific work as we could. In Japan it is the most important fact to study the utilization of Natural Resources. For that purpose, our institute must be developed in future. Mrs. Hubbs and your family are quite well? My wife and father died during the war and now I have five children and new wife. I hope you will come soon again. Please remember me to your family.

Yaichiro Okada

Dr. Erik Stensiv writes from Stockholm that Dr. Albertin Carlsson, Prof. G. De Geer, and Prof. C. Wiman are dead. He and Prof. Nils Holmgren are well. Both have the same address: Rikamuseum, Stockholm 50, Sweden.

Obituary

Frank Blair Hanson
1886-1945

In his twofold career as a teacher and investigator in zoology and as an officer of the Rockefeller Foundation, Dr. Hanson contributed importantly in the development of modern biology and natural science. To all who had the privilege of knowing him intimately, his passing on 21 July last has been the source of deep regret. He will be remembered as a highly respected teacher, an effective and productive investigator, an able administrator, and a most congenial companion.

Dr. Hanson's forebears traveled to Ohio in a covered wagon, and his family settled in Bloomington, Illinois, where he was born on 15 July 1886. As a youth he aspired to a professional career, but financial exigencies required that he make his own way after graduation from high school. While working at a government post in Washington he attended evening school at George Washington University, from which institution he received a scholarship in 1909 and a bachelor's degree in 1913. A course in zoology, taken as a formal requirement, awakened his interest and determined the course of his future career. After graduate work at the University of Illinois he was appointed instructor in zoology at Washington University, St. Louis, in 1916. The department, then housed in the basement of the Chemistry Department, was later shifted to a wooden building left over after World War I. With the late Caswell Grave, who came as head of the department in 1919, Dr. Hanson helped to plan the excellent new quarters of the department in Rebstock Hall and to develop, from inauspicious beginnings, a highly effective Zoology Department.

Appointed professor of zoology in 1924, he became one of the university's prominent figures. His lectures, given largely without notes, were unusually lucid. His genial and mellow sense of humor, frequently embellished with a delightful whimsey of expression, was completely his own. His enthusiasm for research, unaccompanied by emotional display, kindled a like spirit in his students, many of whom now occupy important posts in biology and medicine.

Author of some fifty publications, his interest first centered in comparative anatomy and embryology. In 1923 he became interested in genetics. Following a period with Professor Muller in 1927, his investigations were concerned almost exclusively with radiation genetics, a field in which he made important contributions. Particularly significant was his demonstration that radiation-induced gene mutations occur in proportion to the induced ionization, one mutation resulting from one quantum exchange.

Dr. Hanson's association with the Rockefeller Foundation began when he served as assistant in the European fellowship program of the Foundation from 1930 to 1932. A year after he returned to Washington University he joined the permanent staff of the Foundation and in 1936 he became associate director of the natural sciences division. His wide interest in scientific matters, quiet temperament, and unquestionable integrity made him well suited for this position. He was a sympathetic but undemonstrative listener and his judgments on matters of research grants were fair and impartial.

The Marine Biological Laboratory at Woods Hole was close to Dr. Hanson's heart. He overlooked no opportunity to further the work of that important center of biological research. In many ways the outstanding library of the Marine Biological Laboratory may be considered a lasting monument in his memory. With his family, Dr. Hanson delighted to spend the summers at Woods Hole.

Never robust in health, Dr. Hanson's ability to carry on in spite of a heart condition, probably contracted in his youth, is a tribute to his courage and determination. In each phase of his career he was aided by the care and assistance of his devoted wife, the former Harriet Roman Cavender, whom he married in 1910 while still an undergraduate in Washington.

Dr. Hanson's last weeks were saddened by notification that his son, Lt. Frank Blair Hanson, Jr., had been lost with his ship, a destroyer escort sunk in the Atlantic by a German submarine a few days before V-E Day. This loss was naturally a great blow and seemed to contribute to his ill health.

Besides his wife, Dr. Hanson is survived by two daughters, Miss Blair Hanson, assistant professor of French at Allegheny College, and Dr. Phyllis Claire Hanson, assistant in pathology at the University of Rochester.

FRANCIS O. SCHMITT
Massachusetts Institute of Technology

In the Laboratory

Notes on the Possibility of a Histochemical Method for Localizing Adenosinetriphosphatase

FLORENCE MOOG and H. BURR STEINBACH
Washington University, St. Louis

In *Science* (1945, **102**, 429–430), Drs. Glick and Fischer presented a paper on "The histochemical localization of adenosinetriphosphatase in plant and animal tissues." Although an efficacious method for demonstrating this important enzyme histochemically will be of immense value in physiological research, our interest in this matter prompts us to point out that the invention of such a method is beset with difficulties which Glick and Fischer failed to mention.

First, it is by no means clear that the "ATPase" which the authors claim to demonstrate in their sections is in reality anything but ordinary phosphomonoesterase. That alkaline phosphomonoesterase working at about pH 9.0 will hydrolyze all three phosphate groups of ATP is well known (*3, 6*). Since this phosphomonoesterase can, of course, be demonstrated in acetone-fixed, paraffin-embedded sections (*2*) and must certainly be active in frozen sections, it is inevitable that this enzyme will register its presence by Glick and Fischer's method. Mouse heart, the test object reported on, possesses small but not inconsiderable alkaline phosphomonoesterase activity (*4*); one can say with assurance that the activity is great enough to produce a visible result in the 18- to 24-hour incubation period which Glick and Fischer found necessary for embedded sections. Consequently, the presence of ATPase[1] in either embedded or frozen material can be diagnosed only by precise comparison of tissue exposed to the ATP substrate solution with tissue treated identically except for exposure to glycerophosphate or other monoester of phosphoric acid as substrate.

Second, the notorious lability of ATPase makes it difficult to believe that this enzyme would survive the rigors of histological preparation. Every author who has reported on ATPase has remarked the necessity of working rapidly and at low temperature (see, for example, DuBois and Potter (*1*)), and in embryo homogenates the enzyme even begins to be inactivated within 10 minutes reaction at 37° (*5*). Singher and Meister (*7*) have similarly shown that purified myosin preparations tend to lose activity at 37°. Further, acetone fixation itself gradually destroys ATPase, as we have found in this laboratory by comparing the activity of a frog mesonephros kept in acetone at 5° C. for only 75 minutes with that of one held in a moist chamber during the same period: the former showed only 34 per cent of the activity of the latter. If acetone fixation is carried on longer, or at a higher temperature, and the tissue is then exposed to the heat of an embedding oven, it seems safe to assume that the ATPase activity will be entirely destroyed.

We feel, therefore, that any phosphate-liberating enzyme which may be localized in acetone-fixed tissues, whether frozen or embedded, and which requires long periods of incubation for its demonstration, cannot be accepted as ATPase unless proved to be such by the application of further tests. It may be possible to visualize the enzyme in fresh or fixed sections of highly active tissue, but the identification can be made in such cases only (a) by showing that the ATP substrate solution allows the appearance of a deposit in regions demonstrated to have little or no phosphomonoesterase activity, or (b) by showing that the ATP substrate allows deposition of calcium phosphate in a given region at a faster rate than does glycerophosphate.

[1] Since the enzyme cannot be readily identified in any case as the one which attacks only the terminal phosphate group of ATP, "adenylpyrophosphatase" would be a preferable term (see O. Meyerhof. *J. biol. Chem.*, 1945, **157**, 105).

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A Transparent Plastic Tank and Cover for the Warburg Manometric Apparatus

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College of Medicine, State University of Iowa

It is frequently desirable to observe the tissues or organisms that are being shaken in Warburg manometric flasks. Since the water bath and cover shown in the accompanying figures is made entirely of transparent plastic, "Plexiglas," the contents of the flasks may be observed easily at all times. The material is much lighter in weight than glass, it is less easily broken, and since the corner joints are cemented

to form a continuous piece of material, there is less possibility of leaks developing than in a glass-metal water bath. The plastic is sufficiently nonconducting to make other insulation unnecessary. The cover helps to maintain the temperature equilibrium and also aids in keeping the water in the bath clean.

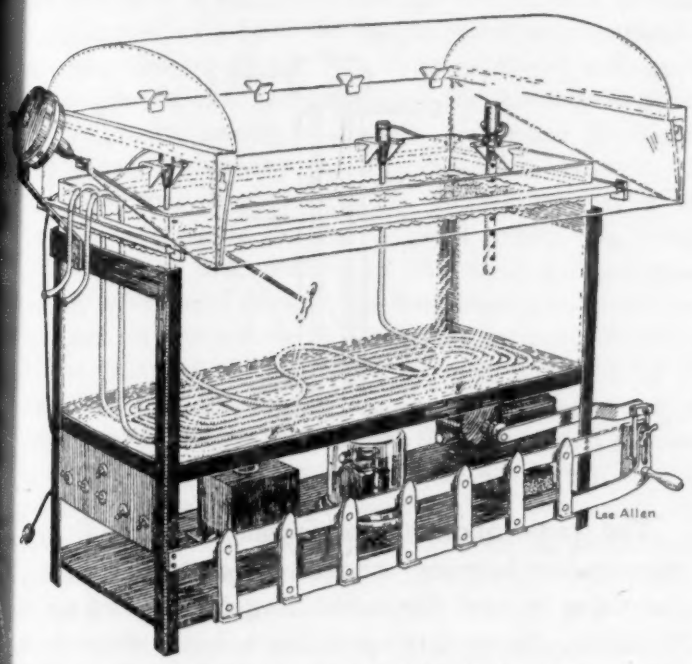

FIG. 1. Assembled transparent plastic tank and cover for Warburg manometric apparatus.

The tank now in use measures $9 \times 11\frac{1}{2} \times 26$ in. and is made of $\frac{3}{8}$-in. plastic sheets, with the corners both cemented and pegged with $\frac{1}{8}$-in. plastic dowels, as shown in Fig. 2, *e* and *f*. Very small holes were drilled the length of the dowels to allow escape of air and excess cement while they were inserted. The cover is constructed of $\frac{1}{8}$-in. material. A cement made by dissolving plastic scraps in chloroform was used for all seals where great strength was necessary. Other surfaces were joined by flowing chloroform from a pipette between the adjacent surfaces. The shelf around the top of the tank serves both as a brace and as a platform for the sidewalls of the cover. To accommodate the sidewalls a groove is cut around the back and two end pieces of this shelf (Fig. 2, *d*, *e*, and *f*). The upper, curved portion of the cover rests on the sidewalls, which have "Y"-shaped receptacle hinges (Fig. 2, *b*) along the top of the back edge. The $\frac{1}{8}$-in.-thick curved portion of the cover was bent by clamping the long edges between wooden 1×2's and playing a lazy gas flame under the sheet until it sagged nearly into shape. Final shaping was done by force, and the 1×2's were clamped in proper position with the curved sheet suspended between two tables of equal height. The "Y" hinges, and the hooked portion of the movable accessory brackets (Fig. 2, *g*) were softened by slowly heating the plastic over a Bunsen burner. When it could be bent

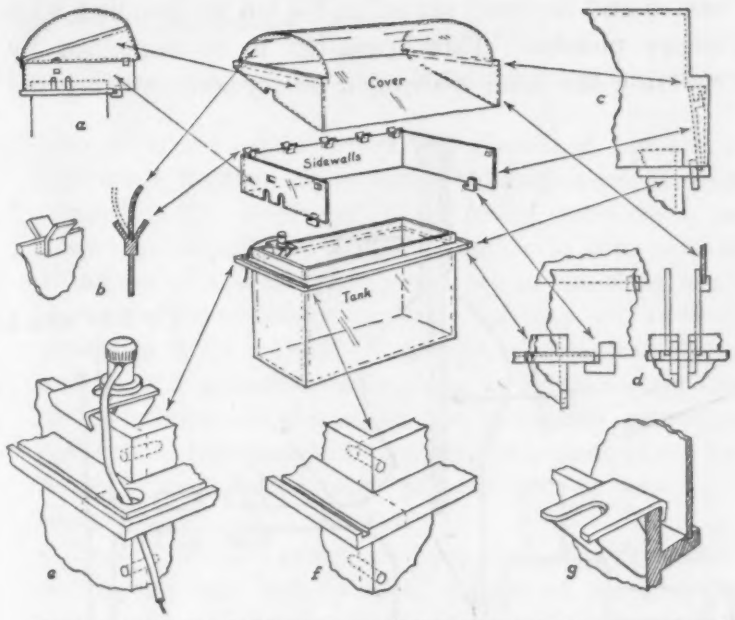

FIG. 2. "Exploded" view of "Plexiglas" tank, cover, and cover sidewalls with accompanying detail sketches: *a*, end view of assembled unit with cover lifted and resting on sidewall brackets; *b*, "Y"-shaped receptacle hinges; *c*, front view of closed cover showing how offset in cover rests on slightly displaced sidewall; *d*, solid hooks on sidewalls locking under shelf and locking device for supporting end of cover when lifted; *e*, construction of top rear corner with electrical accessory in its movable plastic bracket; *f*, construction of top front corner; *g*, view of accessory bracket on a cross-section of the top edge of tank.

with slight pressure, it was shaped over a form and held until cool.

In order to avoid strains and bubbles in the cemented joints of the tank it is advisable to allow 3 to 5 weeks for thorough drying.

A Simple Automatic Pressure-regulating Device for Use With Vacuum Lines

WALTER S. CLARK
Duke University

A reliable pressure-regulating valve for use with vacuum lines can easily be constructed from an ordinary drying tube and some glass tubing. The valve is designed to even off small variations in a vacuum line, rendering the partial vacuum very nearly constant. It is based on a regulator described by Asprey (*1*).

The valve (Figs. 1 and 2) consists essentially of a drying tube (b) with a side arm (a) blown into the body immediately below the bulb, a glass rod (r), and a sealed glass float (f) which is buoyed up by the mercury in the reservoir (m). The end of a glass rod which fits loosely in the tip (t) is heated in a Bunsen flame until a small, solid bead is formed with a diameter somewhat greater than that of the tip. Removed from the flame, the bead is carefully flattened and again revolved in the flame until it assumes an ellipsoidal form as shown (g). After grinding off the tip of the drying tube evenly, the rod (r) is in-

serted and the bead seated in the tip by grinding with emery powder. This operation is accomplished by covering the bead with oiled emery and rotating the rod with the fingers from the opposite end. For best performance, the valve seat (s) should be given a second polishing with fine emery. The rod (r) is then cut off about the level of the side arm. A float (f) can be fashioned from an ordinary glass vial which is of such dimensions as to slip freely inside the body of the drying tube (b). To operate at low-pressure differential, the valve is set into a mercury reservoir (m) and connected by means of a "T" tube into the vacuum line.

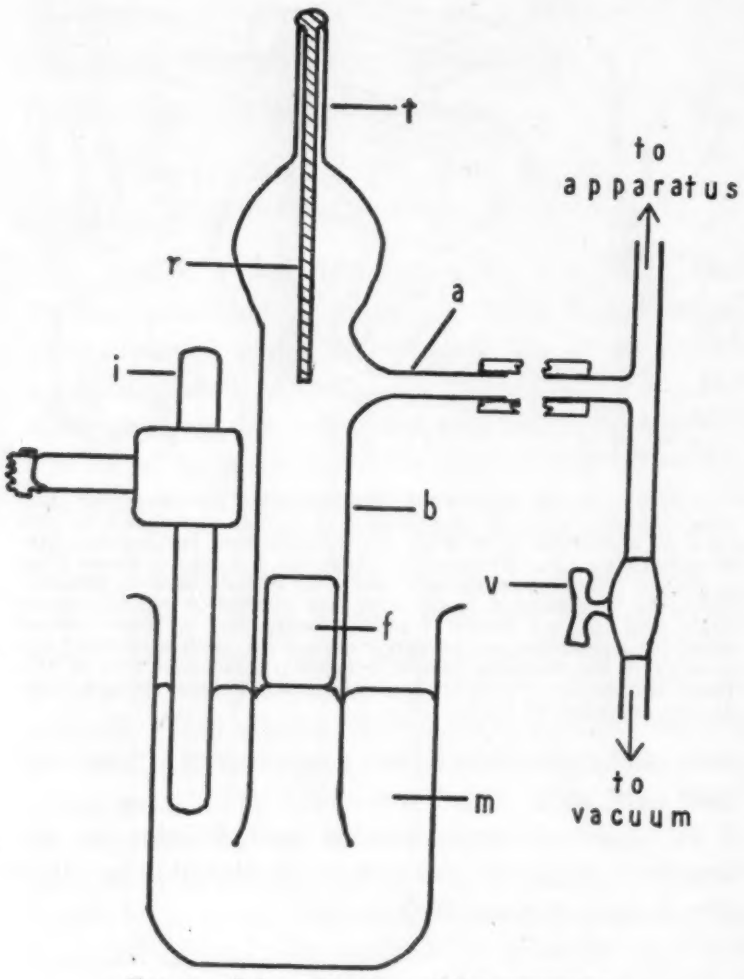

FIG. 1. Schematic view of the apparatus.

In operation, the pressure differential between the inside of the valve and the atmosphere causes the mercury to rise in the absorption tube. The float rises on the mercury column until it contacts the lower end of the valve stem (r) and causes the valve to open, permitting an influx of air. The float immediately ceases to rise, because the air entering the valve tends to lower the pressure differential and causes the mercury to fall. A balance is set up between the line vacuum and the rate of entry of air around the valve seat (s), maintaining a practically constant pressure difference. In this way minor fluctuations in the vacuum source are compensated for by a corresponding change in the rate of air intake through the valve.

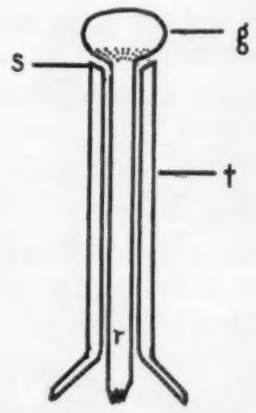

FIG. 2. Detail of the valve.

The valve operates best when connected into the vacuum line between two resistances. If, for example, the valve is used for controlling the rate of air flow through a flowmeter, operation is most efficient when connected into the vacuum line between the vacuum source and the flowmeter. The adjustable valve (v) for controlling the amount of vacuum acts as one resistance while the flowmeter acts as the second. In operation, the control valve (v) is adjusted so that the vacuum applied to the flowmeter is slightly greater than is to be used. The automatic valve then prevents any decrease in pressure below a fixed limit. When connected with a high-resistance apparatus where a strong vacuum is required, the length of the mercury column may be increased by inserting a piece of tubing through a stopper at the bottom of the drying tube and setting this into the reservoir. Any desired rate of flow can be maintained by adjusting the height of the valve above the mercury reservoir, and, where fine adjustment is required, a piece of solid glass rod (i) may be raised or lowered in the reservoir to produce slight changes in the level of the mercury. When used in connection with liquid flowmeters, no significant fluctuations were observed even after several hours of continuous operation.

Reference

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Scanning Science—

Contracts have been awarded for the construction of the Schemmerhorn Hall of Natural Sciences and the Hall of Physics for Columbia College. The proposed new building is to be erected at the Boulevard and 119th street.

—24 January 1896

Letters to the Editor

Blood Group Factors and Racial Relationships

In Fig. 18 of Ashley Montagu's new book *(An introduction to physical anthropology)* is reproduced a modified version of a diagram from the first edition of Prof. A. E. Hooton's *Up from the ape,* in which are represented the relationships among the four principal groups of human populations. In this chart the Australoid group, which includes, among others, the Australian aborigenes and Ainu, is represented as intermediate between the Caucasoid and Negroid groups of peoples, while the Papuans are placed in the Negroid group. In recent studies on the distributions of the various blood-group factors it has been found that Australian aborigenes and Papuans, in common with Chinese, Japanese, Filipinos, Indonesians, and Amerindians, are characterized by the virtual absence of Subgroup A_2 and the Rh-negative type. Among Caucasoid individuals, on the other hand, as many as one-fourth of all Group A individuals belong to Subgroup A_2 and about 15 per cent are Rh negative. Negroes have an even larger proportion of A_2 individuals, and while the incidence of the Rh-negative type is only 7 to 10 per cent, there is an extraordinarily high proportion (about 40 per cent) of individuals of type Rh_0. In view of these findings, the Australian aborigenes and Papuans appear to be more closely related to the Mongoloid group than either the Caucasoid or Negroid groups, and the diagram should therefore be revised accordingly.

A. S. WIENER, M. D.

Serology Laboratory, Office of the Chief Medical Examiner, New York City

Published Misconceptions Regarding the New Clinically Adequate Curare

In the course of amassing and editing references for a multilingual, scientific and historical bibliography of the drug curare, an incredible number of misconceptions and factual errors regarding the substance have been found. Since the literature in English commences in the late Sixteenth Century (and early Spanish references some decades earlier), certain sciolistic errors and conclusions are to be expected in the archaic literature. With the beginnings of pharmacologic (biotrepic) and clinical interest in the drug, in the early middle decades of the last century, the misconceptions become less numerous in the literature dealing specifically with its physiologic actions. However, despite the pioneering work in the ethnobotany of curare, errors still remain fairly constant in matters pertaining to the origin and nature of the drug itself. Then, with the advent in the beginning of this century of the comprehension of the alkaloidal constituents of the drug—and the fractional determinations carried on in various countries—there is a radical diminution of misconceptions relating to its chemical nature.

There still remain, however, not only an unduly large amount of the earlier errors just mentioned, but also an incredible number of widely published misconceptions regarding the *origin* of those allied substances now known generically as curare. That is to say, both the ethnobotany and the pharmacognosy of the drug are in a state of unnecessary confusion as they are currently published in the majority of pharmacologies, toxicologies, and related manuals. This chaos is further augmented to an unfortunate degree by the increasing number of commercial technical bulletins, announcements to the professions, and, indeed, even popular articles relating to recent discoveries in this field.

These published errors are now of particular moment, due to the fact that, in 1939, a form of the drug was introduced to pharmacology (biotrepy) and medicine and was almost immediately proved to be clinically functional and acceptable. While the drug has been employed somewhat in certain spastic entities, and to a large extent as an adjunct to convulsive shock therapy, its major use during the past three years has been as an anesthetic adjuvant in both civil and military surgery. In the light of its increasingly widespread use, and in order to refute, as far as possible, errors of fact regarding the ethnobotany and pharmacognosy particularly of the current, clinically adequate (and Federally accepted) form of the drug, a detailed account of the occurrence in the literature of various of these misconceptions seems necessary. This is especially so in view of the fact that certain of these misconceptions (scientific and historical) recently have been carried over into some few current medical articles and announcements.

This report, in press, is scheduled to appear in the January–February, 1946, issue of *Anesthesiology.*

RICHARD C. GILL

Palo Alto, California

Mumpsimus!

Despite the fact that Professor H. D. Smyth's splendid Official Report (Princeton University Press, 1945) is entitled "Atomic energy for military purposes," it is *nuclear* energy which is responsible for the effects of the so-called "atomic bomb." In 1919 P. V. Wells (*J. Wash. Acad. Sci.*, 9, 262) defined atomic forces as "those which maintain two or more atoms in equilibrium as a single system." The tremendous difference between atomic forces, as evidenced, for example, by the oxyhydrogen flame, and nuclear forces, as evidenced by the so-called "atomic bomb" (which is estimated to release only about one-half of one per cent of the total mass-energy involved), may be seen from the following:

4 grams H + 32 grams 0 = 36 grams H_2O + 136,000 calories

1 gram H + 7 grams $_3Li^7$ = 8 grams $_2He^4$ + 5,000,000,000 calories

Nuclear energy is of a totally different order of magni-

tude than atomic or chemical energy, which heretofore was the basis of explosives.

The unfamiliarity of the general public with the nuclear structure of the atom should not prevent scientists from selecting a proper expression for what is now erroneously called the "atomic bomb." While this choice should be left to those who did the outstanding work, whatever expression is chosen should point up the fact that the energy released is *nuclear.* Possibly "nuclear fission bomb" might serve. A paper in Vol. VI of *Colloid chemistry, theoretical and applied,* now in press, is entitled "Potential nuclear energy and some consequences of its release." The pioneer work on diffusion by Thomas Graham, father of colloid chemistry, was useful in working out the uranium fluoride diffusion process at Oak Ridge, Tennessee, where U 235 was separated from U 238. In fact, it was in his paper on "Liquid diffusion applied to analysis" (*Philos. Trans. roy, Soc.,* 1861) that Graham proposed the word "colloid" to describe those substances which, as regards to diffusion, "are slow in the extreme."

Please consider this as a protest against the perpetuation of a *mumpsimus,* a term introduced into our language to indicate persistence in obvious error, from the fact that an old priest who had for forty or more years used this word refused to change to *sumpsimus,* even when shown the correct word in the prayerbook.

JEROME ALEXANDER

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Proposed International Association of Scientists

Would it not be appropriate for the American Association for the Advancement of Science to join with the venerable British Association for the Avancement of Science in organizing a United Nations Association for the Advancement of Science? Such an international association of scientists might serve, through the example of the American and British Associations, to promote the best interest of scientists generally, throughout the world, toward international harmony and good will.

The American Association of Scientific Workers proposes that there be full cooperation with the United Nations Educational, Scientific, and Cultural Organization (UNESCO), which was created at the Charter Conference held at London in November 1945. Representatives of forty-three nations unanimously approved the charter for UNESCO. The science division of UNESCO offers an opportunity for effective international cooperation in science.

Perhaps the AAAS could suggest that scientific societies throughout the world apply for membership in UNESCO. This would form the basis for a United Nations Association for the Advancement of Science.

Such an organization could serve many important functions. Most importantly, it could help to maintain the standards and ideals of scientists throughout the world. It might effectively promote international congresses in various scientific fields. Helpfully to all scientists, it might publish a weekly international scientific journal. Indeed, *Science* and *Nature* might join together to become such an international scientific journal, of course with an opportunity for publication and translation of articles in various languages. Such an organization might effectively promote interchange of scientific workers and scientific information throughout the world.

It appears that an admirable opportunity exists for scientists to indicate their interest in international scientific cooperation. Much may depend on the reaction which scientists may give to this opportunity.

CHAUNCEY D. LEAKE, *Vice-President*
Medical Branch, University of Texas, Galveston

The Portuguese Man-of-war as a Food Source for the Sand Crab (*Emerita pacifica*)

Along the windward side of the Island of Oahu, Territory of Hawaii, there are numerous sandy beaches which are widely frequented for bathing purposes. Although extremely popular and well adapted for recreational purposes, there are at various times large numbers of the Portuguese man-of-war, *Physalia utriculus* Escholtz, present in the water. These animals drift in from the open sea, and their poisonous sting is highly obnoxious to bathers.

In an attempt to determine the number of individuals present at Lanikai Beach, the number of individuals which had been washed up along a measured distance of the beach were counted. It was noted that there were many fewer along the beach than were present in the water and that such a method would not produce an accurate quantitative measure. Although it was not possible to make any further observations on the number of Portuguese men-of-war present, the reason for the discrepancy in numbers was soon discovered.

Along the beach at the intertidal zone, and concentrated particularly in the area of wave wash, are to be found large numbers of the Pacific sand crab, *Emerita pacifica* (Dana). These animals were observed to grasp the Portuguese man-of-war as it was being washed in and draw it quickly beneath the sand. In many instances the crab was observed to have difficulty in drawing the float under, and the next wave would carry both crab and coelenterate higher onto the beach. As a Portuguese man-of-war became stranded, numerous sand crabs were observed scurrying toward it from distances up to five feet during the interval between waves. The stimulus for this behavior is evidently visual, since it was observed to be preceded by the extension of the stalked eyes above the surface of the sand and outflowing water, and the conditions would seem to exclude the use of the other senses. It is possible to collect large numbers of the sand crab by digging out the sand beneath such stranded Physalia. In two instances, 23 and 11 individuals of both sexes and of different sizes were obtained by scooping out a double handful of sand under Physalia with floats which measured 2.5 and 2.0 inches in length, respectively. Local beach fishermen collect the sand crab

for bait by digging beneath stranded men-of-war in this manner.

There can be no doubt that the sand crabs utilize the Physalia for food, inasmuch as the blue color of the tissues of Physalia could be readily observed in the mouth, stomach, and gut of crabs taken in the manner described above. Furthermore, microscopic examination of the digestive-tract contents demonstrated the presence of nematocysts. The poison appears to have no deterrent effect on the crab. The sand crab was not observed to feed on any other material which was washed ashore, although pieces of fish and meat were used in an attempt to attract them. It seems unlikely that these animals feed exclusively upon Physalia, but it is certain that this coelenterate constitutes an important item in their diet.

DAVID D. BONNET

Honolulu, T. H.

High School Science

The anomalous situation of a declining registration in science courses in the high schools in an age which has been called either the "Scientific Age" or the "Atomic Age" is a concern of all who are interested in the advancement of science.

Before the outbreak of the war there had been a constant decline in the election of science courses. The war training program resulted in an artificial boom. Boys, particularly, were either programmed arbitrarily in science courses as a preparation for induction in the Army, or they were persuaded to take such courses by the lure of more favorable assignments in the Army. Now there are indications that the decline has been resumed. How may we account for this apparent lack of interest in science election in an age when science and its applications are having such tremendous influences in shaping our lives?

It may appear trite to repeat that the primary function of secondary schools is to give the pupils the most desirable educational experiences at the adolescent level. Secondarily, they should be concerned with "preparation for life beyond the high school." We have had a very extensive experiment under the auspices of the Progressive Education Society in its Eight-year Study, the results of which support the validity of these objectives in the order named. Nonetheless, we still use the criteria of college entrance requirements as the chief determinants of the high school curriculum for those who plan to continue their education beyond the secondary schools.

Here I believe is the crux of the problem. College admission boards have accepted a year of science as adequate preparation for college work as against three or more years of language, two or more years of mathematics, three or more years of social studies. The college admission boards are undoubtedly influenced by their members, which include the professors of the various subject areas. May we then place the responsibility for this inadequate science requirement upon our college professors of science? I believe we may do so with some justification.

It has been my experience, as well as that of many of my colleagues, that many college professors of science are inclined to belittle science instruction on the secondary school level. It is a very common experience to require pupils who have had secondary school science to repeat such work in the colleges. We have the testimony of great numbers of our students who have had chemistry, for example, that the work they had in our high schools was in every way comparable in quality and quantity with that of the freshman course in college. The same judgment has been made with respect to biology and physics.

In committee meetings between college professors and administrators and secondary school teachers and administrators, I have heard it asserted that the science professors would just as soon have the high school graduates come to college without any science preparation. And such statements are made in the presence of professors of other subject areas. Language men hold no such superior attitude, and accept at face value the language preparation given in secondary schools.

I cannot speak with authority of the quality of the science instruction in other secondary schools in this country, but I do know what it is in this large city, and I am quite certain it is matched in most of the high schools of the country. Certainly the science instruction in any high school is as effectively done as is that in any other subject area. Why, then, should not our college professors of science accept the work done in high school science as adequate preparation for advanced study as professors in other subject areas do?

The present one-year entrance requirement may be, and often is, satisfied by a first-year science course in "general" science. The course is general and elementary, the children are immature, the teaching procedures necessarily largely demonstrative and descriptive, and the contents pretty well forgotten by graduation time. If a boy or girl is accepted for admission to a college with only such science preparation, the college science professor may not draw any conclusions from it as to the quality of secondary school science instruction.

I am writing this note to emphasize the need and importance of a continuing science program throughout the period of education of all children. College science professors may not, and should not, remain aloof. Promoting the study of science at lower levels will not only improve the quality of instruction possible at higher levels, but will promote an interest in science in the community and in the country, and develop the knowledge, attitudes, and appreciations necessary for life in this scientific age.

Specifically, if college admission boards were to require a three- or even a two-year science sequence for admission to college, it would improve the situation immeasurably with respect to the study of science in secondary schools. The three-year sequence is the more desirable, for it will enable the secondary schools to give the pupils a more rounded science experience. We should accept a two-year sequence as a step in the right direction.

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Book Reviews

The social systems of American ethnic groups. (Yankee City Series, Vol. III.) W. Lloyd Warner and Leo Srole. New Haven, Conn.: Yale Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1945. Pp. xii + 318. $4.00.

This series is a significant contribution to the social sciences as an ambitious attempt to analyze in detail the life of a modern American city with the methodological tools of the anthropologist as well as those of the sociologist. In the present volume the authors describe the processes and extent of adaptation of the various ethnic groups to the culture of the city. It is an addition both to the general description of life in Yankee City and to our knowledge of the problems of immigrant peoples adjusting to an alien culture.

The scope of the study is summarized by the authors in these terms:

"1. To describe in detail . . . the steps and processes by which eight ethnic groups have

a. progressively advanced in the major status hierarchies of Yankee City and

b. progressively adapted the internal organization of their community systems.

2. To analyze the factors . . . attending these processes. . . .

3. To abstract wider generalizations concerning the nature of social assimilation and acculturation" (p. 32).

The advance of the ethnic groups in residence location, economic status, and social status, and changes in such institutions as the family, the church, language and the school, and "associations" are analyzed comparatively, institution by institution. These analyses are carefully done in terms of the precise historical circumstances effecting each change. Much detailed information is added to our knowledge of how culture change is initiated and the manner in which old institutions adjust in culture contact.

However, the general idea that ethnic groups experience "conflicts" and undergo "adjustments" has long been established and accepted. It is time to take the next step and study acculturation as a condition of forced and accelerated change of culture *patterns,* in which the relationships between institutions and their function in terms of human needs are thrown into relief, and thereby use the "laboratory situation" of acculturation to facilitate an understanding of the dynamics of culture. To do this the authors should have treated the cultures as units, for to study culture one must study it as a complete pattern of functionally related institutions. As a matter of fact, even individual institutions should not be studied apart from an explicitly stated cultural framework, since the significance of any one institution lies in its functional relationship to the entire pattern.

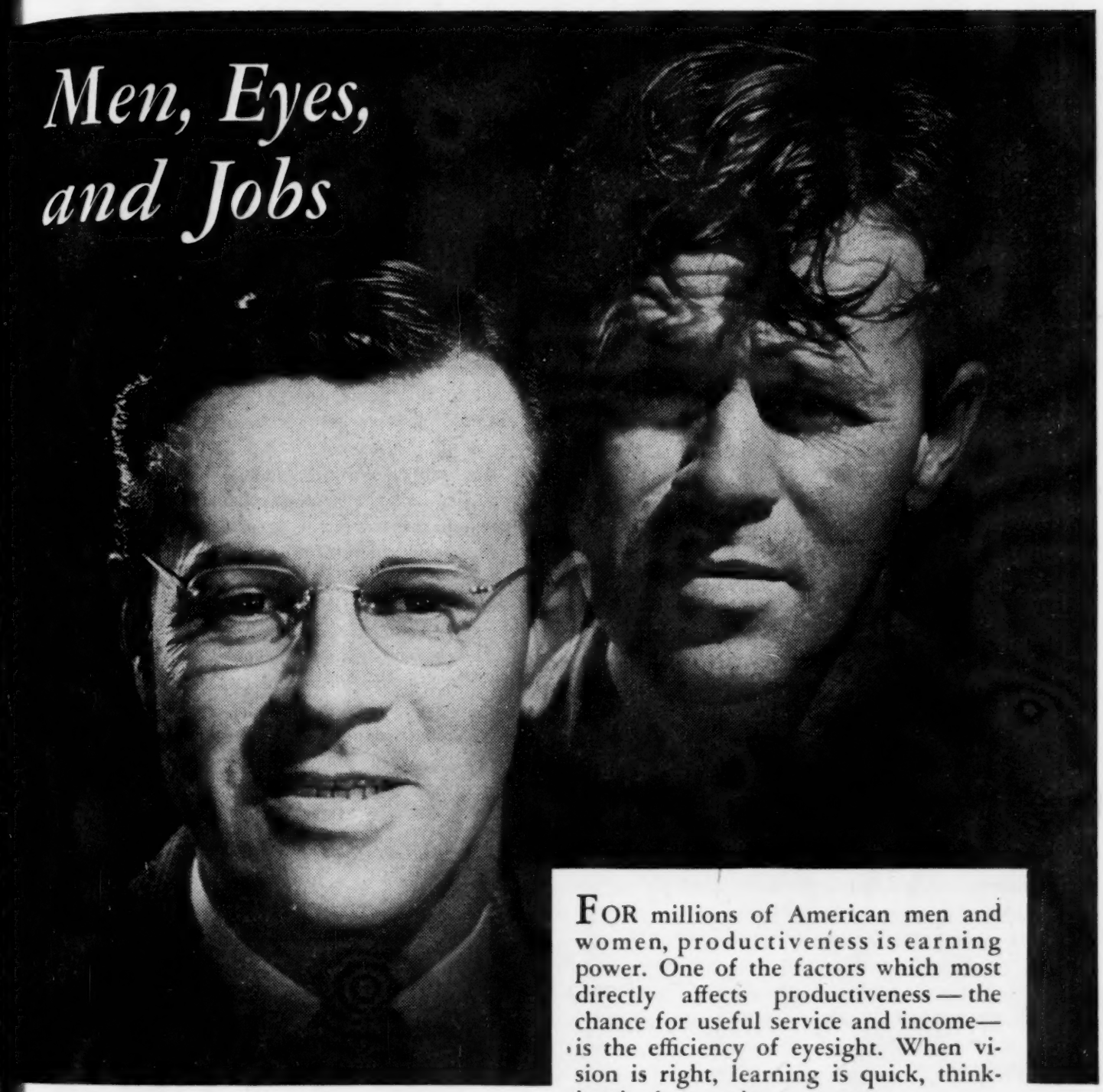
Also, treatment of our contact with ethnic groups as though it is merely a matter of their becoming Americanized is a tacit concession to ethnocentrism. Acculturation is not a one-sided affair. Cultures in contact influence *each other.* Furthermore, an entire field of study, the influence of the subordinate groups on the dominant group and on other subordinate groups, is automatically excluded from consideration.

The authors present their "wider generalizations concerning the nature of social assimilation and acculturation" in the form of a statement that the "degree of subordination" and the "period of assimilation" of ethnic groups in America are a function of: (1) cultural divergence from the American norm, (2) racial divergence from the American norm, or (3) a combination of (1) and (2). A table is presented, based on this generalization and using language and religion as the sole criteria of cultural similarity. This table is offered as a basis for predicting the fate of ethnic groups introduced into the American milieu.

There can be no issue with the generalization that cultural and racial similarity tend to facilitate assimilation into American society; it is what one with a knowledge of the history of American ethnic groups would have concluded a priori. However, exception may be taken to using such a simplistic scheme as a basis of prediction. Causation in the social sciences is not a simple affair of one or two variables, but is the result of a number of variables, some of which tend to be dominant in most instances. These variables are conditioned by historical circumstances which often give dominance to variables which have previously been regarded as minor factors. A number of additional variables may be suggested which have at times played important roles in determining the fate of ethnic groups: the size of the group in relation to the assimilating groups, the prestige of the country of the group's origin, the ability or inclination of the group to accommodate rapidly (which can be a matter quite apart from its cultural similarity), plus all the possible accidental historical circumstances which may surround the meeting of the two groups. Exceptions may be noted among the groups studied by the authors. Some of the groups did not "advance" during the early years of their residence in Yankee City largely because they wanted to earn money to take back to Europe and did not want to advance in the social system of Yankee City. On the other hand, the Jews advanced rapidly despite the fact that by virtue of their language and religion they belonged at the bottom of the list of these ethnic groups. Their advancement was due to their superior familiarity with business life, a cultural factor not considered in the authors' table.

Nevertheless, the field work, analysis, and writing of this study are excellent. When confronted with a concrete problem of causation, the authors do not rely on the simplism of the final chapter, but make a detailed analysis in terms of all relevant factors. Likewise, the description of institutions stresses their function in

Men, Eyes, and Jobs



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broad, cultural framework, which is apparently an implicit referent for the authors, even though it is nowhere explicitly stated.

RAYMOND A. BAUER, Ensign, USN

Washington, D. C.

Advances in carbohydrate chemistry. (Vol. I.) W. W. Pigman and M. L. Wolfrom (Ed.). New York: Academic Press, 1945. Pp. xii + 374. $6.00.

This book is the first volume of a series, which is designed to present special topics in the chemistry of the carbohydrates as completely as the literature will permit at the time of the preparation of the manuscript. It is fortunate indeed that the word "recent" was not prefixed to this name, for such a prefix has no significance within a few weeks or months of the time the book appears on the market.

According to the Preface, "The increasing tempo of research and the consequent increased specialization of research workers make it desirable to provide frequent reviews of important developments in carbohydrate chemistry, not only for the carbohydrate chemist, but also for research workers in other fields and industry, chemists and teachers."

The current volume devotes 36 pages to the Fischer cyanohydrin synthesis and the configurations of higher carbon sugars and alcohols (C. S. Hudson); 40 pages to the altrose group of substances (Nelson K. Richtmyer); 52 pages to carbohydrate orthoesters (Eugene Pacsu); 18 pages to thio- and seleno-sugars (Albert L. Raymond); 28 pages to the carbohydrate components of the cardiac glycosides (Robert C. Elderfield); 18 pages to metabolism of the sugar alcohols and their derivatives (C. Jelleff Carr and John C. Krantz, Jr.); 54 pages to the chemistry of the nucleic acids (R. Stuart Tipson); 32 pages to the fractionation of starch (Thomas John Schoch); 36 pages to the preparation and properties of starch esters (Roy L. Whistler); 36 pages to cellulose esters of organic acids (Charles R. Fordyce); and 20 pages to the Index.

The footnote bibliographies list 1,001 literature citations. The book is written well, edited well, and printed well. It is a must volume for any scientific library.

EDWARD F. DEGERING

Purdue University

Scientific Book Register

ADDISON, HERBERT. *A treatise on applied hydraulics* (3rd ed.) New York: Wiley, 1945. Pp. 623. (Illustrated.) $6.50.

ANSON, M. L., and EDSALL, JOHN T. (Eds.) *Advances in protein chemistry.* (Vol. II.) New York: Academic Press, 1945. Pp. xiv + 443. $6.50.

BAILEY, ALTON EDWARD. *Industrial oil and fat products.* New York: Interscience Publishers, 1945. Pp. (Illustrated.) $10.00.

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1. "Glass Plastic Cast" by Roger Anderson, M.D., and Herbert R. Erickson, M.S., in *The American Journal of Surgery*, LXIX, 3 (September 1945), pp. 299-305.

2. "Fiberglas Used as a Root Canal Filling Material" by Harry Maeth, D.D.S., in *The Dental Digest*, LI, 10 (October, 1945), pp. 555-556.

3. "Significance of the Nitrogen Loss in the Exudate from Surface Burns" by John W. Hirshfeld, M.D., Harold H. Williams, Ph.D., William E. Abbott, M.D., Carl G. Heller, M.C., Ph.D., and Matthew A. Pilling, M.D., in *Surgery*, XV, 5 (May, 1944), pp. 766-773.

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6. "Rayable Gauze as a Factor of Safety in Surgical Operations" by Edward F. Lewison, M.D., in *Bulletin of the American College of Surgeons*, XXVII, 1 (January, 1942), pp. 39-40.

7. "The Effects of Fiberglas on Animal and Human Skin" by Marion B. Sulzberger, M.D., and Rudolf L. Baer, M.D., in *Industrial Medicine*, XI, 10 (October, 1942), pp. 482-484.

8. "Fiberglas Health Hazard Investigation" by Walter J. Siebert, M.D., in *Industrial Medicine*.

9. "Hazards of Exposure to Glass Wool, Glass Frit or Foam-Glass" by B. J. Hein, M.D., in *The Journal of the American Medical Association*, CXXIV, 3 (January 15, 1944), pp. 187-188.

10. *Report of the Director of The Trudeau Foundation*—1941 by LeRoy U. Gardner, M.D., last page, describing findings based on inhalation tests in which animals were exposed to glass fiber dust.

11. *Health Aspects of Fiberglas Materials*, 8-page brochure, published in April 1945, for plant physicians, industrial hygienists, safety engineers, and others interested in a documented summation of facts relating to the subject.

12. *Transcript of Remarks* on "Health Aspects of Fiberglas Materials" by W. G. Hazard, U.S.P.H.S. in *Proceedings of the Rhode Island Industrial Health Institute*, May 19, 1943.

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